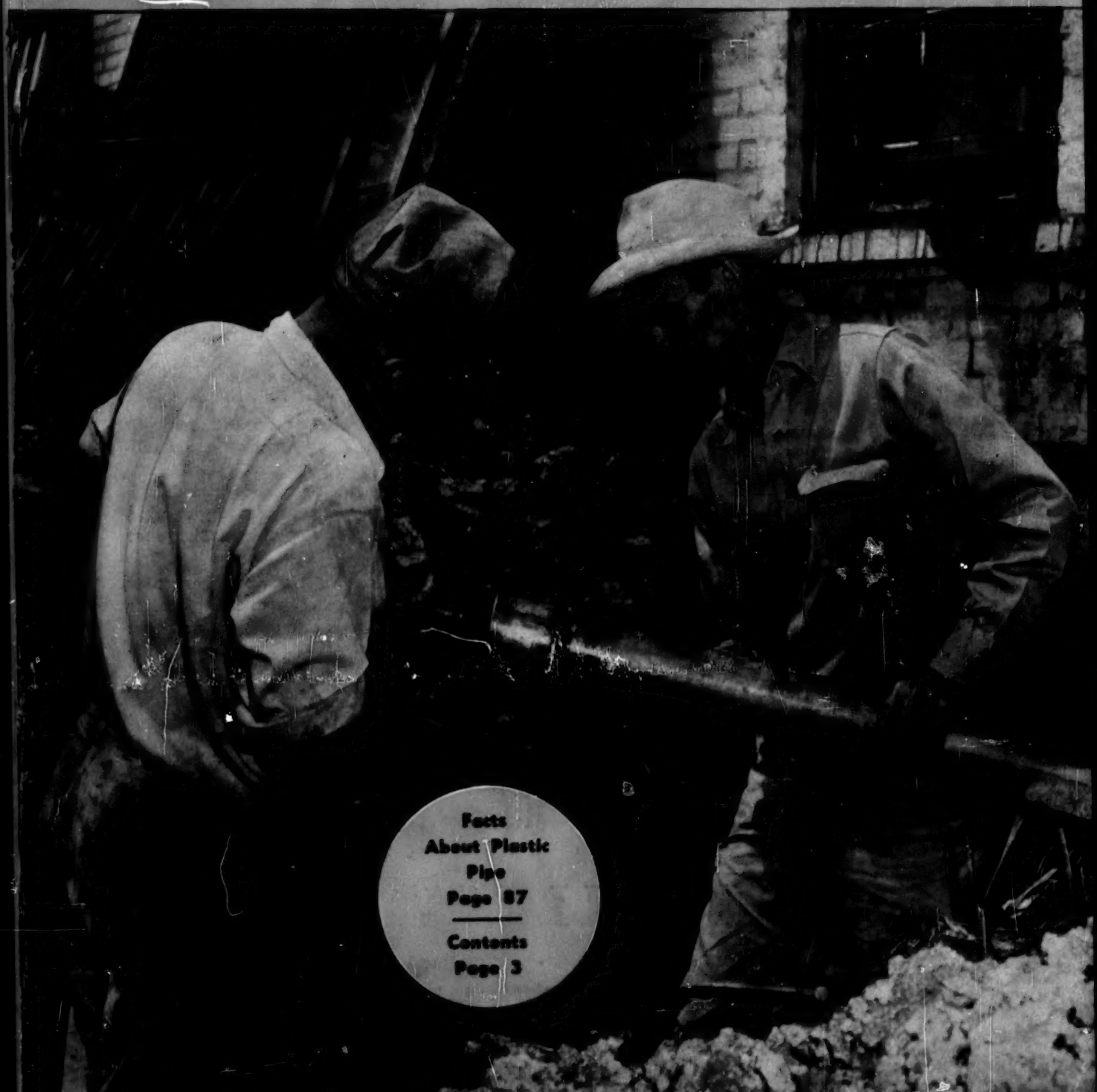
AIR CONDITIONING HEATING AND VENTILATING

JANUARY, 1953—51st YEAR



Facts About Plastic Pipe
Page 87

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THERE'S A STOCK GRINNELL HANGER FOR EVERY PIPING REQUIREMENT

With Grinnell Pipe Hangers you get better, stronger installations in less time. You not only save money on assembly — but on costly call-backs and maintenance, because Grinnell Hangers permit adjustment *after* pipe is erected. This makes it easy for you to correct sagging pipe, water traps . . . to provide positive drainage for the entire system.

Remember, there's a stock Grinnell hanger for every piping installation . . . from a simple water pipe to a high pressure, high temperature steam line. Where necessary, there are Grinnell engineered hangers to compensate for thermal movement.

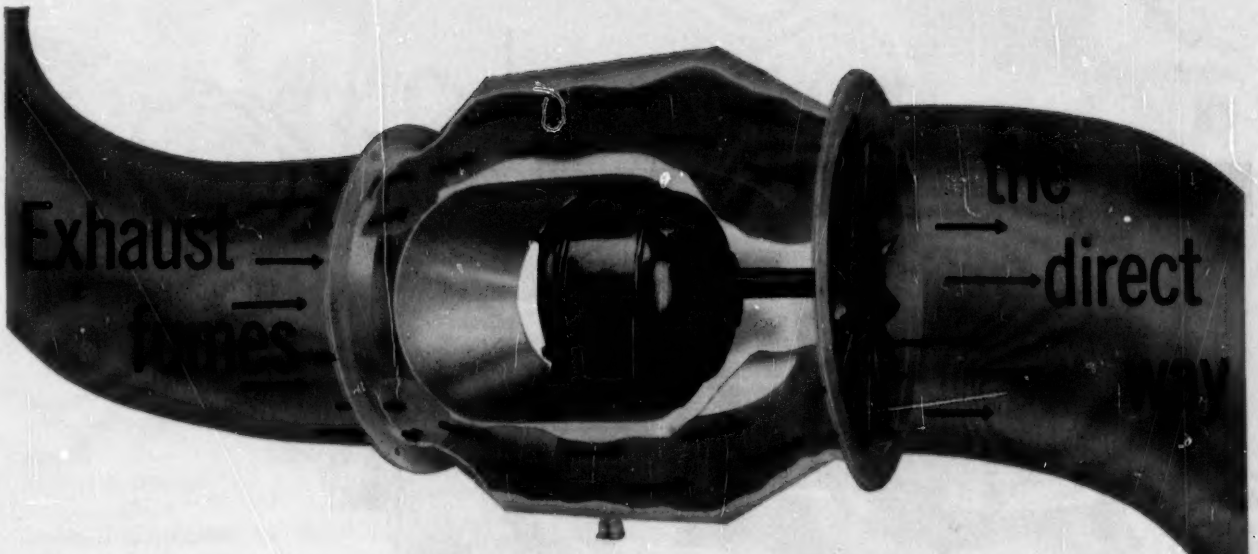
Make sure your piping installations are *right on the beam.* Let Grinnell supply the correct hangers to meet all your needs. Grinnell hangers comply with piping code requirements.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

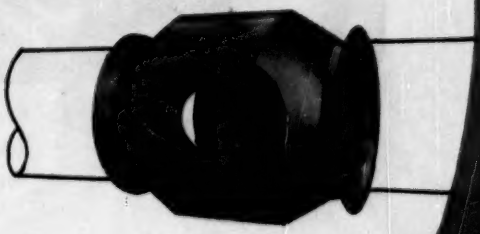
Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems



BIFURCATOR FAN EFFICIENTLY EXHAUSTS HOT, CORROSIVE, FLAMMABLE AND EXPLOSIVE FUMES

Bifurcator Fans exhaust fumes at *top efficiency* by avoiding a directional change in the air stream. Other fans often require a 90° change in direction of the exhaust stream with resultant loss in efficiency.

The fan motor stays clean, cool and accessible. Fumes are by-passed (bifurcated) around the motor chamber which is completely isolated from the exhaust stream.



Bifurcator Fan installs just like a section of ductwork.

A Bifurcator Fan is easily installed . . . just like a flanged section of ductwork. It can be mounted horizontally, vertically or at an angle. Lightweight and extremely compact, a Bifurcator requires no platform or supports. Bifurcators are available in sizes from 1140 CFM (12" diameter fan with 1/20 HP motor) up to 45,000 CFM (48" diameter fan with 20 HP motor). Housings and fan wheels can be fabricated of non-corrosive metals, or can be protected with a variety of corrosion-resistant coatings.

Be ready with the facts about Bifurcators next time you have a fume removal problem. Fill in and mail the handy coupon below . . . TODAY!

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American Machine and Metals, Inc.
East Moline, Illinois

Please send me "Design Data for Exhaust Systems" and Bifurcator Bulletin DB-4-52.

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CITY _____ ZONE _____ STATE _____

NAME AND TITLE _____

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Maintenance costs per year per unit — based on the average of 51,816 traps — was 2.8¢. And 20,850 of these traps averaged less than .8¢ per trap — less than a penny a year!

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Before your next trap purchase, get facts and figures from your Webster Representative. He can give you full details of Webster Radiator Traps, Radiator Valves, Float and Thermostatic Traps, Dirt Strainers and other equipment for steam heating or process steam applications.

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Webster Heating experience includes the field of vacuum, vapor and low pressure steam heating of buildings . . . medium pressure steam in industrial and process heating applications . . . and hot water heating systems for all types of building. Webster's specialized experience is available to you through engineers at the Home Office and through Representatives in 65 cities across the nation.

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AIR CONDITIONING HEATING AND VENTILATING

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JANUARY, 1955

VOLUME 52, No. 1

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Cover: Making a plastic to steel pipe connection, using a plastic insert adapter. Photograph, courtesy of Yardley Plastics Company.

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Washington News

LORING F. OVERMAN

As Washington prepared for the coming of the 84th Congress, it became apparent that the Administration plans to continue placing its chips on the idea that "good business is good politics." Loss of control of both House and Senate, as well as the chairmanships of committees, has not altered the Administration's viewpoint. In preliminary conferences with leaders of both political parties, President Eisenhower called for continued bipartisan support of policies based on the premise that individuals can prosper only if business is successful.

There was, however, one obvious shift in the Administration viewpoint. Instead of scheduling its moves as a brake on a declining economy, 1955 actions were being planned with the assumption that the business upturn is real, healthy, and encouragingly strong.

Unions Agree

Some Washington observers, in judging the business outlook as favorable, find comfortless verification in the activities of major unions. Union economists, it seems, have read the business signs and have found them encouraging. Based on their readings, they have given their unions the go-ahead for important pay increase demands, as well as drives for fringe benefits and the guaranteed annual wage.

Although it is expected that the unions will listen to compromise offers somewhat lower than their original bids, it is indicated that many will go ahead with strikes rather than retreat. This assurance, while sobering to any employers who may have hoped to coast along, do have two encouraging aspects.

The first favorable feature is that the unions expect business gains to last. The second, closely related to the first, is that the unions are basing their drives on "good business and its ability to pay," just as the Administration is resting its case on the vote-getting power of good business.

Industry and commerce have always been able to work out a satisfactory arrangement with labor when production and distribution are in balance. Conversely, when government alone is the paymaster—through either individual or business pump-priming—there inevitably comes a time when the well will run dry.

Why Fear Automation?

With labor conceding (perhaps even exaggerating) the ability of business to absorb further wage costs and continue returning a profit to stockholders, it is surprising to see the amount of criticism directed at the newest American advance—Automation. The secret of automation is explained as the use of machines to control other machines. In auto factories for example, complete engine blocks are being produced without being touched by human hands. And in offices, automation is taking over more and more of the boring tasks of sorting, counting, and processing figures and data.

It is suspected that alarmists, rather than solid unionists, may be responsible for the whispering campaign against Automation. Pointing to the advancements which followed the first introduction of machines into industry, the Automationists predict that the new machine age will increase the general average standard of living "in the only way it can be permanently increased—through an increase in productivity."

Defense Production an Example

Typical example of the first fruits of automation is the stepped-up national defense program. Included are the following scores since 1950:

Steel—up from 100 million tons to 124 million tons.

Aluminum—doubled in three years to 1,540,000 tons.

Electric power—increased from 69 million kilowatts in 1950 to an estimated 103 million kilowatts this year, and another 12 million kilowatts scheduled for 1955.

Petroleum refining—rose from 5.4 million barrels of crude oil in 1950 to more than 8 million barrels this year.

Despite these gains, the fourth annual report of the Joint Congressional Committee on Defense Production points out that some expansion goals have not yet been met. It is in these fields that automation may be called on to step up the pace. The Office of Defense Mobilization defines an expansion goal as "the deficit between anticipated requirements and the capacity of industry to meet them." Of 224 goals in the current program, 128 have been reached, the report revealed.

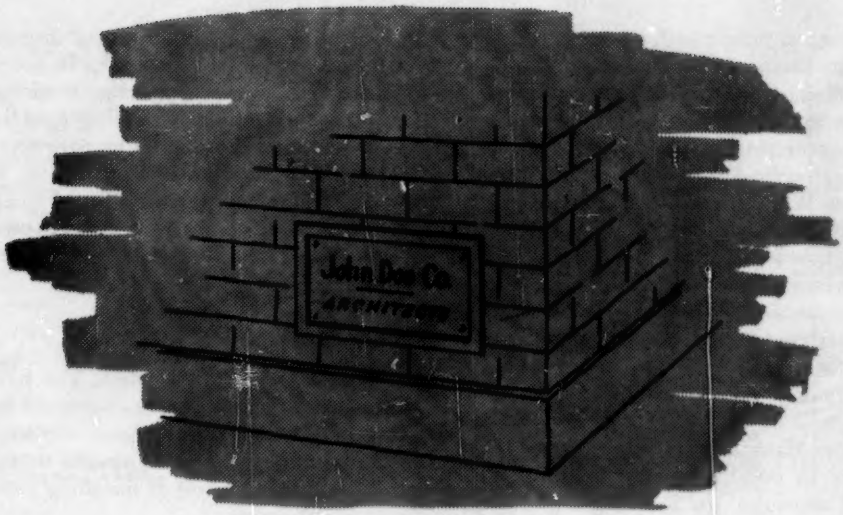
The report of the Joint Congressional Committee indicates that some of the goals may involve special inducements to private industry, or possibly government operation of certain plants if private enterprise does not show interest in the projects. In either event, the air conditioning industry may as well get set to participate, for the services rendered by air conditioning and its related industries are becoming increasingly important to the production and performance of modern armaments.

Atomic Industrial Forum Active

If labor appears a bit skittish over the introduction of more automation, the power industries can hardly be said to be at ease when the subject of atomic energy is considered. Just how far the atom is to move into the power field is not yet known, but powerful forces are wrestling for control of this new force.

Some Washington observers, for example, feel that there is more than meets the eye in all of the excitement over the Dixon-Yates contract. They do not feel that the terms of the contract or the reputations of the participants are the real issue. Instead, they point out, the question is seen as one involving who is to control the nation's atomic power—government, or private enterprise.

This viewpoint starts with the theory that the atom is to be the important power source of the future—and that whoever controls the nation's power controls the nation. The Dixon-Yates matter, they say, is as simple as



Is Destructive Condensation Jeopardizing Your Reputation?

SPECIFYING on a "take-it-for-granted" basis, some architects and builders with their own hands sow the seeds of destruction inside the walls of buildings they are so proud of.

A sturdy, frame house in Pennsylvania, for example, had to be moved. But it was found that the sills had rotted away. Inside the walls was ordinary insulation and no metallic vapor barrier.

A large brick and steel apartment development in the suburbs; a huge housing project in a big city; each caused great expense to its sponsors when ordinary insulation inside walls failed to prevent excess vapor flow, excess condensation formation, resulting in peeling paint and crumbling plaster.

Reputations as well as buildings are guarded by the use of multiple accordion aluminum. Its continuous metal sheets, 500 ft. to 750 ft. long, are almost impervious to water vapor. Infiltration under flat, stapled flanges is slight.

COST OF INFRA INSULATION INSTALLED
in new construction between wood joists, material with labor,

Type 6-S under 9½¢ sq. ft.
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INFRA INSULATION, INC., 525 B'WAY., NEW YORK, N. Y.

The scientific construction of multiple layers of accordion aluminum, fiber, and air, minimizes condensation on or within this type of insulation.

Of all heat flow through structural spaces, 50% to 80% is Radiation; 7% Conduction; the rest Convection. Multiple accordion aluminum surfaces have a reflectivity of 97% for Radiation or radiant heat, and an emissivity of only 3%. The aluminum and fiber sheets retard outer and inner Convection. The alternating layers of air spaces have low density and therefore slight Conduction.

To obtain MAXIMUM, **uniform-depth** protection against heat loss and condensation formation, it is necessary to use the new **edge-to-edge** multiple aluminum*, **each** sheet of which stretches from joist to joist, and also all through the flanges for further vapor protection as well as permanent attachment of each sheet.

*Patent applied for.

A National Bureau of Standards brochure: "Moisture Condensation in Building Walls," interestingly discusses Vapor Flow, and causes and control of Condensation. Use the coupon for free copy.

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that. Is government to control tomorrow's power, or will it be controlled by private companies?

They then draw an enlightening conclusion by asking a question: Suppose you had been asked, 20 years ago, to determine whether government or industry could best develop three great public services—television, air transportation, and highways. Which would you have estimated would make the greatest progress? Which, according to today's standards, now lags behind the others?

Regardless of the outcome of such speculation, or of guesses concerning the importance of the atom, plans for its employment in industry continue. A recent announcement by the Atomic Industrial Forum, Inc., a non profit group of organizations interested in peacetime development of nuclear energy, tells of the establishment of an industrial Nuclear Reactors Materials Committee. Its task is to develop techniques in construction of peacetime nuclear power plants. Companies participating in the work of the new committee are Allegheny Ludlum Steel Corporation, Aluminum Company of America, Babcock and Wilcox Co., Climax Molybdenum Co., International Nickel Co., Lukens Steel Co., Nuclear Metals, Republic Steel Corp., Titanium Metals Corp. and Vanadium Corp. of America.

The group is the first of several to be established to consider special problems arising from the industrial development of nuclear energy. It will survey the adequacy of materials research in the nuclear field, promote publication and dissemination of existing and new data, and initiate and sponsor research and development necessary to fill the gaps of knowledge in the field.

Capital Outlays Continue

Important though nuclear energy may be, the immediate outlook for capital equipment expenditures is of more current interest to A-C folks. Spending for new plant and equipment, which had been expected to recede sharply during the closing quarters of 1954, were surprisingly steady. Total for the year was estimated at $26.7 billion for new plant and equipment—a figure only 6 percent below last year. The figure includes a 35 percent decline in expenditures for capital equipment by railroads, most of the cuts being made in the first quarter of 1954.

The outlook for 1955 is particularly encouraging. Although there is still no reason to expect any great new outlays for new plant and equipment, the Department of Commerce and Securities and Exchange Commission expect activity at the rate of $26.0 billion. With business on the upturn, there is still the possibility that the plant and equipment total for next year, like that of 1954, may be even higher than the forecast.

Mobilization Base Studied

A new Department of Defense Directive (No. 3005.3, dated December 7) has been issued to make it clear that price alone is not to be the deciding factor in awarding contracts for the 1,000 end-items on the Defense Department Preferential List. The DOD official directive says (in part):

"The military departments are requested to review proposed procurement of items contained in the Department of Defense Preferential Planning List. Such review should take into consideration the following: maintaining multiple sources of supply, geographical dispersal, avoidance of undue concentration of contracts in a few leading suppliers, multiple awards, preservation of essential skilled labor forces, utilization of existing open industrial capacity, preservation of essential management organization and know-how, maximum subcontracting, and any other factors relevant to maintaining a sound mobilization base. In this connection, comparative price experience shall be utilized to negotiate the best possible price for the government."

Washington Miscellany

Smog Abatement Aid Proposed. Tax relief for industries which spend large sums to solve the smog problem will be sought in the 84th Congress, according to Senator Kuchel (R.-Calif.). The relief sought would permit taxpayers to amortize the cost of installing anti-air-pollution facilities in 60 months.

Plastic Pipe Standards. The Commodity Standards Division of the Department of Commerce has announced that copies of commercial standard CS197-54, for dimensions and tolerances for flexible standard wall polyethylene pipe, are now available. The standard covers inside diameters and wall thickness of 10 sizes of pipe ranging from one-half inch to six inches in diameter. Copies of the standard may be purchased at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Schools, 10 to 12 Billion. Air conditioning and heating folks who do business with the nation's schools will be intrigued by the frequent reference to 10-12 billion dollars as the value of school construction needed throughout the nation. Latest reference to the huge total is in the December report of the subcommittee of the House Committee on Education and Labor. The subcommittee, which is headed by Rep. Carroll D. Kearns (R-Pa.) commented: "Hearings held by the subcommittee have demonstrated that the national interest requires that the Federal Government join with state and local governments in solving this pressing problem. Adequate education of our children is essential to the preservation of a free and strong nation. Their education must not be impaired by the serious classroom shortages which exist in every state."

Coal Industry Aid Urged. "Remedial" legislation in the 84th Congress, to reinvigorate the coal industry quickly because of its importance to national defense, is urged by Senator Harley M. Kilgore (D-W. Va.). The West Virginia Senator conceded that the fact that the President has appointed two special commitees to study coal and energy problems indicates that the Administration realizes the importance of keeping the industry healthy.

Gas Hearing Postponed. The Federal Power Commission postponed from December 15 to January 11 the hearing of oral arguments on proposed new rules for the establishment of fair and reasonable rates to be charged by independent producers and gatherers of natural gas to be sold in interstate commerce. The extensions were made at the request of interested persons desiring more time to prepare arguments.

100-Million KW Electric Power. The nation's installed electric power capacity topped 100 million kilowatt hours during October, the Federal Power Commission has announced. Total on October 31 was 100,007,211 kilowatts.

In Atlanta, Georgia

WROUGHT IRON PIPE stands the test of time . . .

Here's more proof of economical piping with wrought iron. As you can see by the years of service life to date recorded in the arrows at the right, wrought iron pipe has proved more than a match for corrosion in these Atlanta buildings. The result—long-life, maintenance-free installations.

Today's high replacement and repair costs underscore, more than ever, that SERVICE LIFE, not initial costs, is the only sound guide to economical pipe selection. In installation after installation, wrought iron pipe has proved its economy by doubling, tripling and even quadrupling the useful life previously obtained from low-first-cost-piping.

You'll get a good idea how wrought iron has served and saved for others by reading over our bulletin, *Piping for Permanence.* Write for a copy today.

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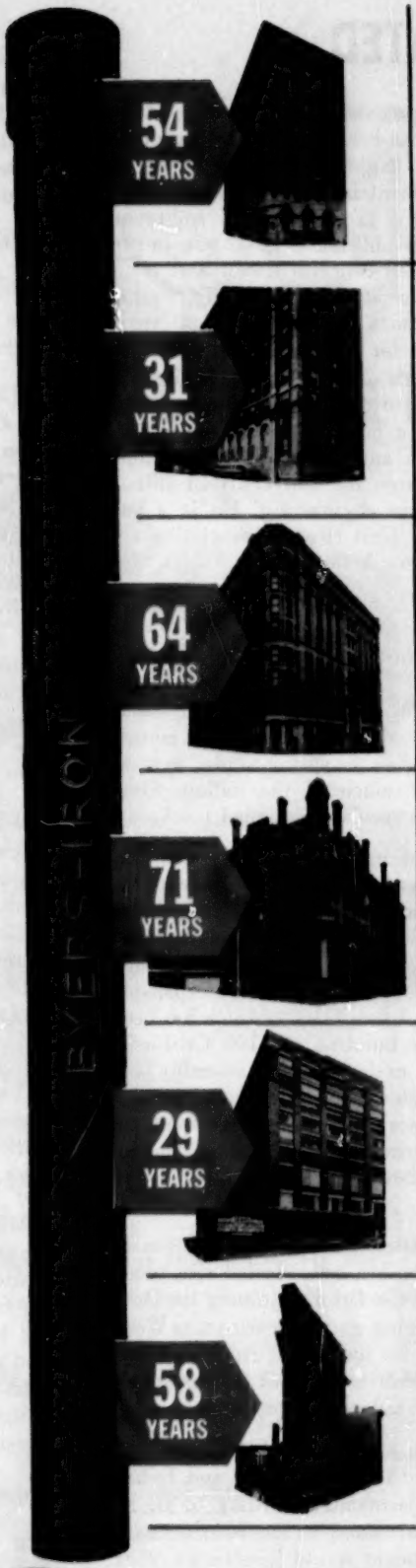

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SERVICES: Waste lines, soil lines, vent lines, downspouts, house drain (original building)

BILTMORE HOTEL
Erected 1924

SERVICES: All cold water lines

TRUST COMPANY OF GEORGIA BUILDING
Erected 1891

SERVICES: All water supply, drainage and heating system piping

KIMBALL HOUSE
Erected 1884

SERVICES: All water supply and steam heating systems

SEARS, ROEBUCK and CO. BUILDING
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SERVICES: All plumbing and heating system piping except drainage

GEORGIA SAVINGS BANK BUILDING
Erected 1897

SERVICES: Hot and cold water lines, heating system lines

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CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY STEEL PRODUCTS

BRIEFLY STATED

• Arthur G. Dixon, vice president of the Modine Manufacturing Co., of Racine, has been assigned to coordinate and direct the company's engineering activities. In his new capacity as vice president in charge of engineering, Mr. Dixon will supervise a broad program embracing a series of new products in addition to those now in production. Mr. Dixon has been concerned with heat transfer product design and the styling of heating, cooling and air conditioning products for more than 30 years. He has been a Modine director since 1953 and vice president since 1948. During his 28 years with Modine, he has also served as heating division sales manager, corporation secretary and as a member of the engineering staff. Mr. Dixon was born and raised in the St. Louis area and was graduated from the University of Illinois with a bachelor's degree in engineering. He is a past president of the Industrial Unit Heater Association and the Convector Manufacturers Association.

• Penn Controls, Inc., of Goshen, Indiana, presented the premiere of Controlorama, its all-new educational control show for heating, air conditioning and refrigeration engineers and servicemen on November 18 at Hotel Oliver in South Bend. The show made its appearance in South Bend to try out a unique concept in automatic control shows before it hits the road in the spring to play in some forty cities scattered over much of the nation. Show equipment is installed in a specially designed truck.

• Although they built and moved into their new factory only a year ago, Barry Blower Co., Minneapolis,, manufacturers of industrial blower wheels built exclusively to individual specifications of other heating and air conditioning manufacturers, have found that demand for their product has become so great that expansion plans have had to be made. A new brick addition has been added to the main factory building at 3100 California St. N.E. that will be used exclusively for assembly and shipping. Manufacturing blower wheels exclusively for industrial uses, Barry Blower Co. expect to appoint additional sales-engineer representatives in major manufacturing centers where they are not presently represented.

• Walter S. Browning, assistant secretary and sales manager for the past four years, has been elected vice president-sales of C. A. Dunham Co. Prior to joining the Dunham Co. in 1948, Mr. Browning was for seven years Western Division sales manager for the Parker Appliance Co., Cleveland. Norman F. Sorgenfrei, assistant sales manager since 1953, has been appointed sales manager.

• The General Electric Co., Commercial Products Department, has been renamed the Commercial and Industrial Air Conditioning Department, according to G. K. Iwashita, department general manager. Mr. Iwashita said the renaming of the department would involve no other changes in its organization.

• The appointment of Keith T. Davis to a new assignment on the executive staff of Affiliated Gas Equipment, Inc. was announced recently. Mr. Davis will assume the title of technical director and among other duties will continue his activities in representing the corporation in trade association programs and contact with major gas utilities. Mr. Davis has been directing the engineering program of the Bryant Heater Division. John H. Jennings has been appointed director of engineering for the Bryant Heater Division. Mr. Jennings has resigned from Servel, Inc. where he directed engineering for all air conditioning products of that corporation.

• John M. Tuthill, assistant general manager of sales for The Youngstown Sheet and Tube Company, has been appointed general manager of sales. Mr. Tuthill, who is now located in the company's Chicago office, will transfer to the main office in Youngstown.

• The appointment of E. L. Hiter as sales manager of the Expansion Joint Division, Flexonics Corporation, has been announced. Mr. Hiter brings 14 years of company experience in metal hose and bellows type expansion joints to his new position. Since 1952, Mr. Hiter has been serving as western manager with headquarters in San Francisco and Los Angeles.

• The Gustin-Bacon Manufacturing Co. has announced the appointment of F. W. Muller as manager of G-B Snap-On pipe insulation sales. In the newly created department, Mr. Muller will direct the company's national sales from their Kansas City headquarters. Mr. Muller was formerly manager of high temperature insulation sales for the Armstrong Cork Co.

• The Public Utilities Commission of Ohio has lifted all residential gas heating restrictions for the Toledo Edison Company and the Bryan Division of the Ohio Gas Company. The order provides for unlimited use of gas for homes. The one remaining restriction is that commercial establishments using more than 1,000,000 Btu per hour must have stand-by equipment near by so they can switch to another type of fuel in case of emergency. This provision applies only to new installations.

• Yarnall-Waring Co. has appointed John A. Steer sales manager of its Boiler Trim Division. Mr. Steer was formerly sales manager of company's Philadelphia and New York districts.

• Minneapolis-Honeywell Regulator Co. has purchased the assets of Heiland Research Corp. of Denver, manufacturer of precision scientific instruments and photographic flash equipment. The 20-year-old Denver firm will be operated as a new Honeywell division. The Heiland part of the name, widely known in the photographic industry, will be retained. The new division will continue to operate from its Denver plant and offices, with the present production, administrative and sales personnel.

• Airtemp Division, Chrysler Corp., has announced a number of promotions involving company sales personnel. S. R. Prugh has been named assistant sales manager in charge of room air conditioners. F. J. Laughna, formerly central division assistant sales manager, has been appointed to succeed Mr. Prugh as administrative manager in charge of sales records, products order, parts order and statistical departments. H. R. Dillon, formerly product order manager, joins the newly formed division as supervisor of room air conditioner sales.

FIFTH OF A 75th ANNIVERSARY SERIES...

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Add to the many fine qualities of the DELANY FLUSH VALVE the plus feature illustrated above — the renewable main valve seat. With it, the DELANY VALVE will last the life of the building. In case high pressure scoring, wire cutting, or galvanic flashing should occur across the seat, it easily can be replaced and the valve returned to service. Although both engineers and maintenance people alike prefer renewable seats on *all* line valves where possible, COYNE & DELANY is unique in supplying this feature in the field of better type diaphragm flush valves—at no extra initial cost. For more detailed flush valve and vacuum breaker data contained in Handbook and Catalog 53, write Engineering Department, COYNE & DELANY CO., 834 KENT AVE., BROOKLYN 5, N. Y.

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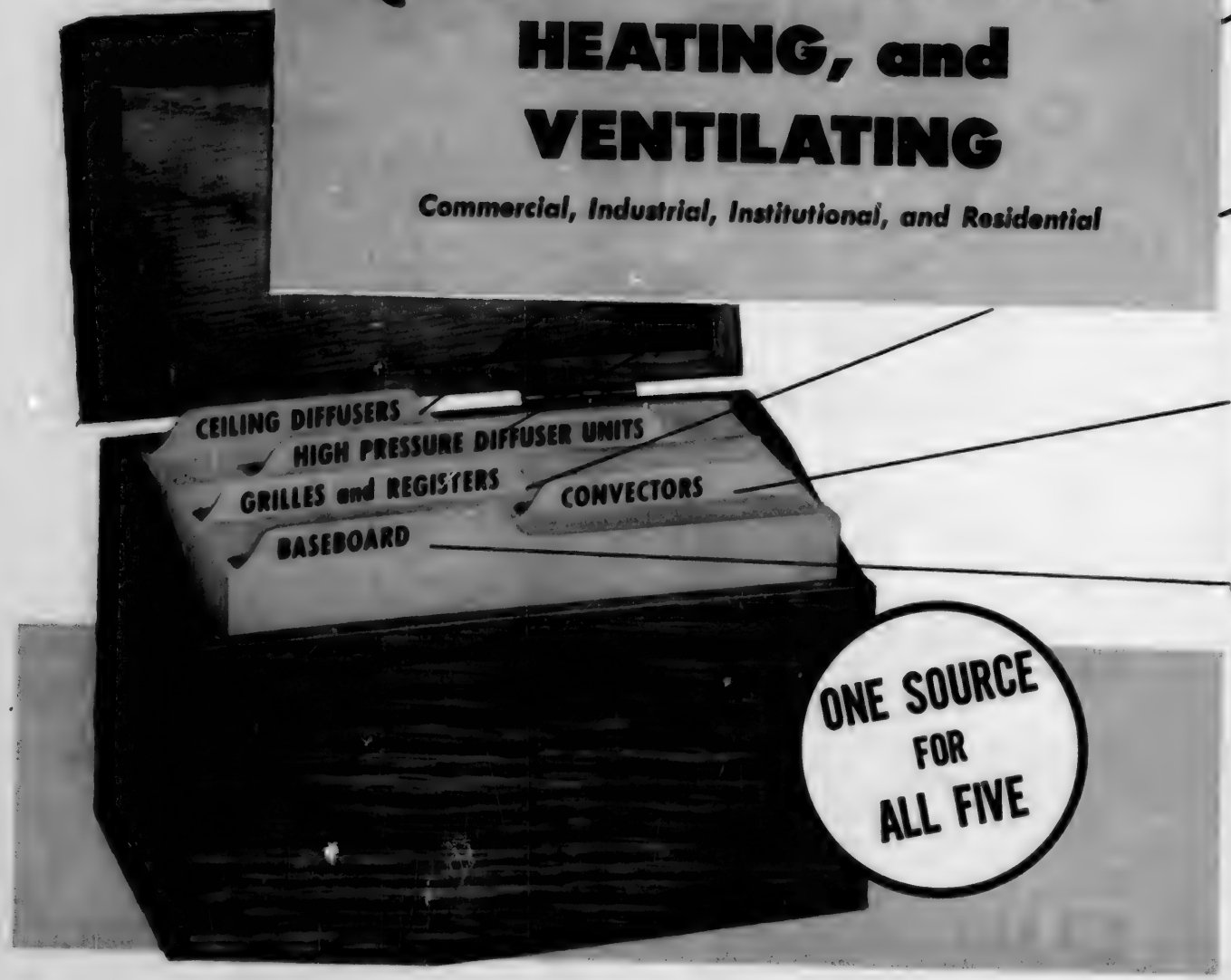
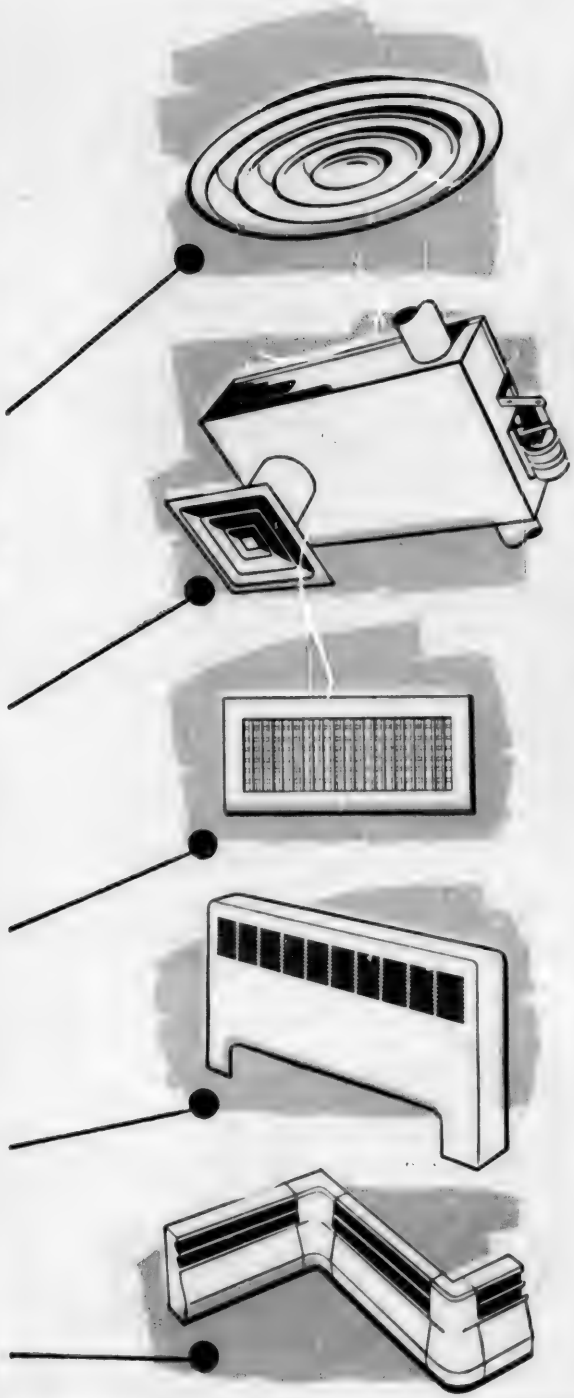
Commercial, Industrial, Institutional, and Residential





Aerofuse Ceiling Diffusers are available in a wide selection of types and sizes, styled and engineered to meet the most rigid requirements of appearance and performance at the point of air delivery.

T & B High Pressure Diffuser Units are the result of many years of laboratory experiment and practical experience in the field. Units now in operation handle branch duct velocities up to 4000 FPM, discharge air without noise or drafts.

Tri-Flex Supply Air Grilles and Registers . . . Aerovane Return Air Grilles and Registers. Standard sizes for economy and prompt delivery. Individually adjustable face bars. Registers equipped with opposed blade dampers.

T & B Convectors are widely used in homes and apartments. Two types are available . . . Type R for recessed installation . . . Type F for free standing installation. Styled for beauty, engineered for comfort.

T & B Baseboard combines the heating comfort and smart appearance essential in the modern home. Two types . . . recessed . . . free standing . . . both designed for ease of installation.

See the
TUTTLE & BAILEY
EXHIBIT
ASHVE Show, Booth 31

TUTTLE & BAILEY inc

NEW BRITAIN, CONNECTICUT

Controlled Comfort····B.B.*

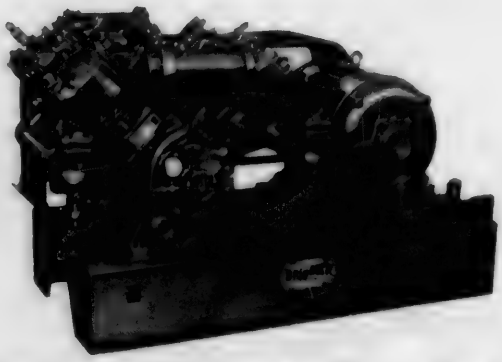
*BEFORE BRUNNER

In days of old, all the King's horses and all the King's men . . . plus the royal fortune . . . couldn't come up with anything better than a simple fan to cool His Majesty's brow.

It took horsepower of another kind . . . electricity plus engineering and design knowhow . . . to create the modern version of "controlled comfort" produced by Brunner.

In air conditioning and refrigeration, Brunner equipment is unequalled for dependability and long life. Brunner design engineers "cut the cloth to fit the coat"... they design the product to meet specific performance standards.

That's why it's always wise to "sell Brunner"... because Brunner design engineering means better performance and lasting satisfaction for your customers.



BRUNNER REFRIGERATION CONDENSING UNITS

for remote air conditioning installation in commercial and industrial applications, are supplied in sizes up to 75 H.P. with capacity control. Brunner Compressor Units for use with evaporative condensers also available up to 75 H.P.

The Brunner Compressor does *more* work with *less* motion. It's huskier than most ordinary compressors . . . larger pistons . . . longer stroke . . . bigger crank case . . . deep-finned heads. These construction features result in a quieter, more efficient compressor that gives extra years of service . . . with less wear on working parts, less maintenance, lower operating costs.

See your Brunner Representative for full information, or write to:

BRUNNER MANUFACTURING CO., Dept. K-155, UTICA, N.Y.
The Brunner Co., Gainesville, Ga.
In Canada: Brunner Corp. (Canada) Limited, Toronto, Ontario

POST

BRUNNER
SINCE 1906

BRUNNER EXTRAS

- Compressor Experience
- Product Research
- Design Engineering
- Wide Product Range
- Proven Quality
- Complete Dependability
- Easy Servicing
- Warranted Performance
- Nearby Distributor Service
- Profit Opportunity
- Advertising Support
- Sales Promotion Help

Here's what's new at CARNES

. . . TWO NEWLY DESIGNED PRODUCTS

1 **NEW MODEL CL**
Centrifugal
ROOF VENTILATOR

2 **NEW MODEL EJ**
DIFFUSER

Carnes' newest power roof ventilator is designed to provide a low contour for today's low parapet buildings . . . and to provide all these fine features: Wide range of capacities; all-aluminum construction; quiet operation; heavy-duty ball bearing protected motors; precision balanced fan wheels and efficient trouble-free service.

Another newly designed model from Carnes. Deep ceiling plate eliminates all ceiling smudging and makes use of anti-smudge cones unnecessary. A full range of sizes is available—all fully adjustable for air pattern.

CAPACITIES.....300 to 6,000 C.F.M. WHEEL SIZE.....5" through 24"

. . . and here's why CARNES makes them better!

AND, WHY YOU CAN DEPEND ON CARNES RATING AND PERFORMANCE DATA

This is Carnes modern engineering and research laboratory. Here, a specially designed building of 12,000 square feet houses complete facilities for expert engineering and thorough testing under actual operating conditions assure that every product bearing the Carnes name is the finest quality throughout.

Visit Us!
at BOOTH 521
12th International Heating and Ventilating Exposition
Convention Hall, Philadelphia
January 24 - 28

CARNES CORP.

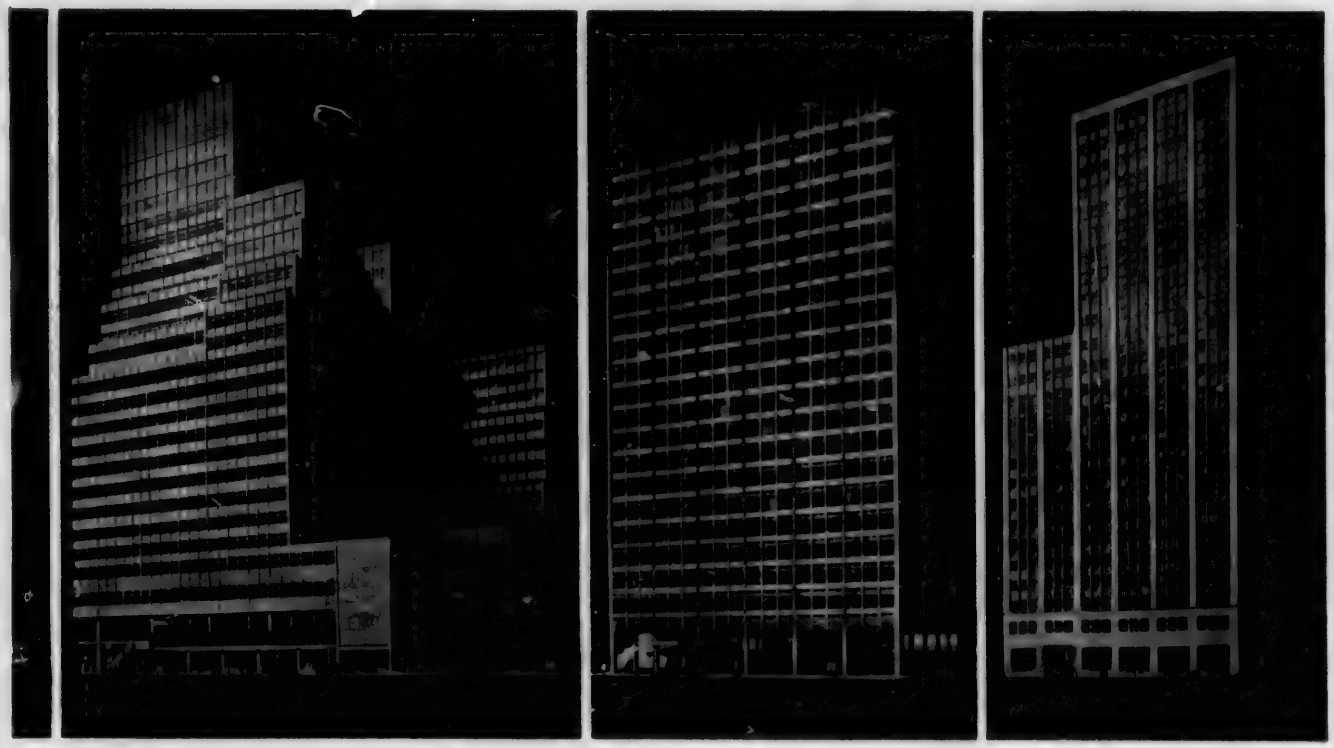
York brought the right kind of air conditioning to Cincinnati's luxurious Netherland-Plaza Hotel, to New York's beautiful Esso Building and to scores of others in addition to the seven famed buildings shown. (1) Miami Beach's magnificent new Fontainebleau Hotel and 26 of Miami Beach's other largest, newest hotels, (2) California's St. Francis Hospital, (3) New York's Empire State Building, (4) Atlanta's new Fulton National Bank, (5) Webb & Knapp's beautiful new 34th Street Building in New York, (6) Denver's new Mile High Center, (7) San Francisco's new Equitable Life Assurance Society Building.

York refrigeration air conditioning

the quality name in

YORK CORPORATION HEADQUARTERS FOR

Why have so many of America's largest, most famed buildings installed Yorkaire Systems of air conditioning?



FROM PHILADELPHIA'S FABULOUS NEW PENN CENTER to office buildings, hotels and hospitals in your own city, think for a moment how many of America's largest, most famed buildings have installed—or *are* installing—Yorkaire Systems of Air Conditioning!

And there is every good reason: a Yorkaire System is the *right kind* of air conditioning . . . precision-tailored to the building.

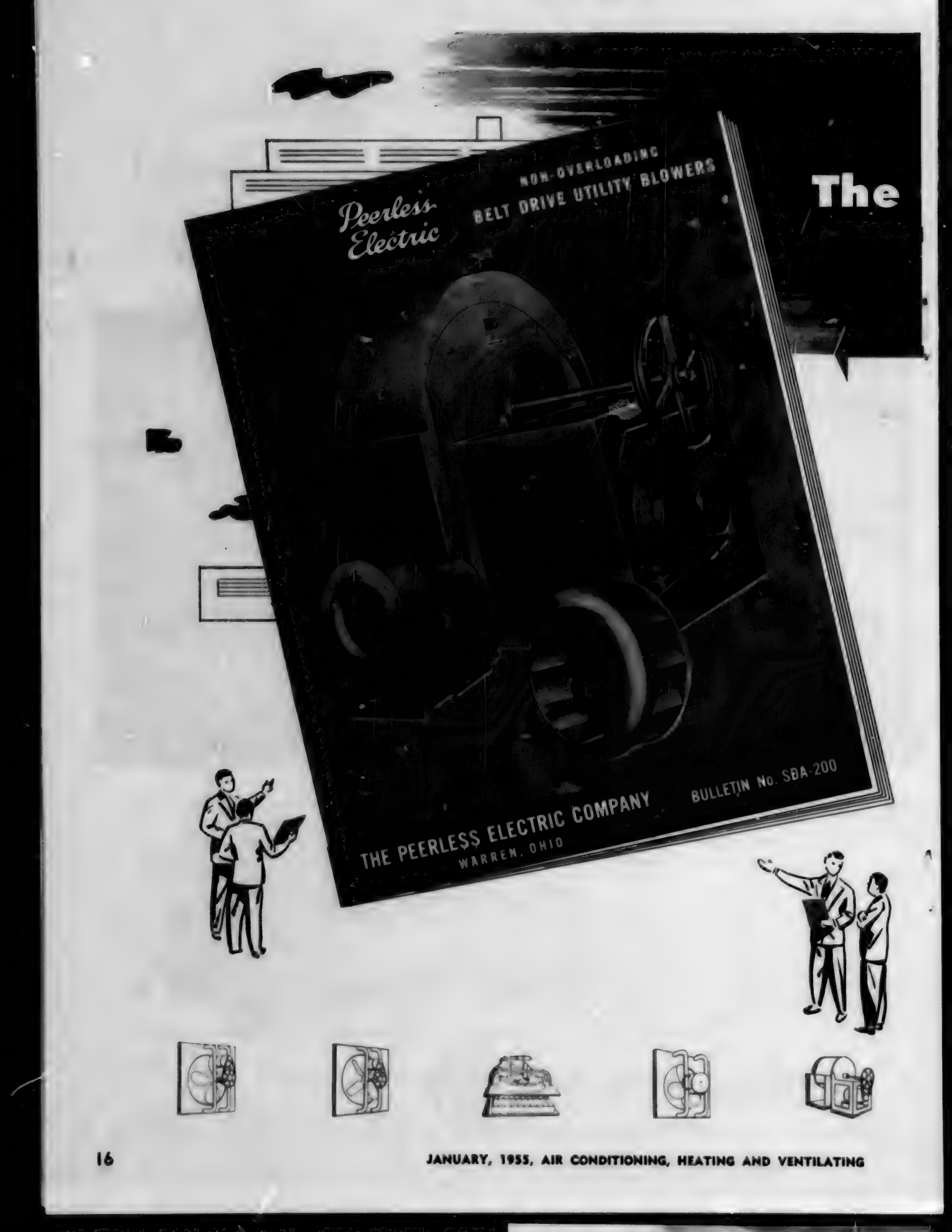
Since glass areas and heat loads and floor areas and numbers of rooms, economic considerations and taxes and depreciation and a score of other factors vary from building to building, up and down the land, obviously no one system—or even two or three—can do the job best for every building. That's why York chooses and tailors each system to fit the particular building in which it is installed. And *that's* why so many of the "tough jobs" come to York.

Apply this knowledge and experience to your own building (old or new). Call your York District Office (located in principal cities and listed in the classified telephone directory). Or write to York Corporation, York, Pennsylvania.

Visit the York Booth (219-227) at the 12th International Heating and Ventilating Exposition

air conditioning and refrigeration

MECHANICAL COOLING SINCE 1885


The
Peerless Electric
NON-OVERLOADING
BELT DRIVE UTILITY BLOWERS
THE PEERLESS ELECTRIC COMPANY
WARREN, OHIO
BULLETIN No. SBA-200

New Peerless® Electric

BACKWARD CURVE BLOWER CATALOG

A COMPLETE, CONCISE, EASY-TO-UNDERSTAND GUIDE TO BETTER INSTALLATIONS

This fact-packed 36-page catalog tells you everything you need to know about backward curve blowers in language you can understand. It shows the complete range of sizes from 12½" to 36½"; lists all performance ratings for each size at each motor rating; shows all variable speed ranges; gives you finger-tip reference to CFM ratings, outlet velocities, discharges and rotations. All blower performance ratings are guaranteed by Peerless. These facts, plus the great, new, Peerless Backward Curve Blower, are the keys to better hospital, school, church, factory and government installations. This Peerless blower is the most dependable in use today. Get the facts in Peerless Catalog SDA-200.

FANS • BLOWERS • MOTORS • ELECTRONIC EQUIPMENT

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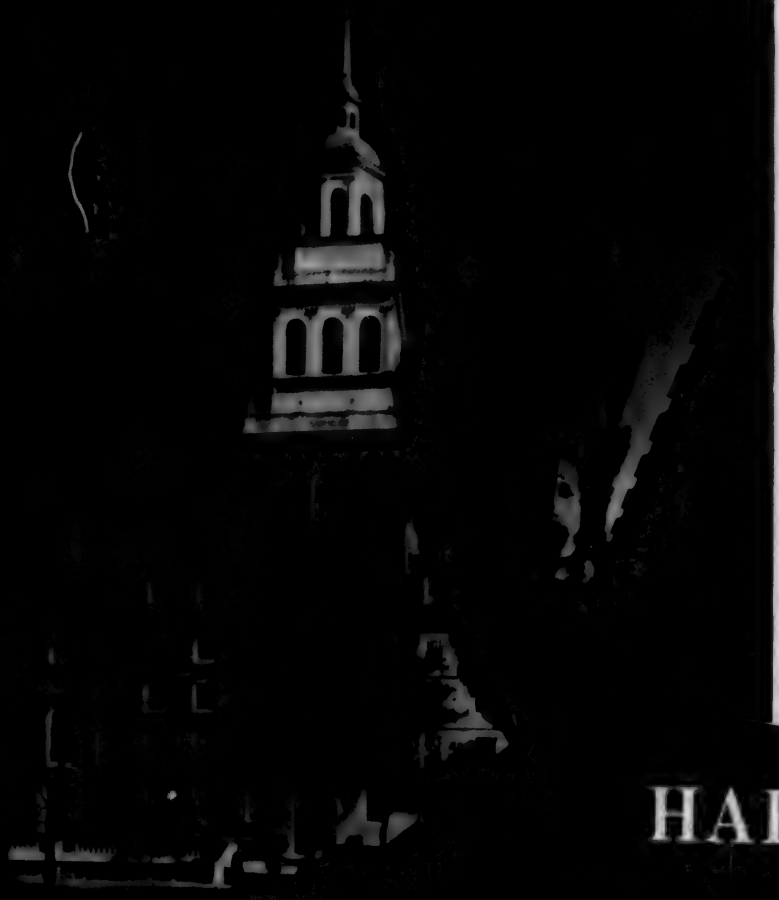
THE PEERLESS ELECTRIC COMPANY • 1400 WEST MARKET ST. • WARREN, OHIO

Peerless Electric



Architects: for Lowell House, Dunster House, McKinlock Hall, Vanderbilt Hall, Littauer Building, Gordon McKay Laboratory–SHEPLEY, BULFINCH, RICHARDSON & ABBOTT • for Aldrich Hall–PERRY, SHAW, HEPBURN, KEHOE & DEAN and McKIM, MEAD & WHITE, Associate Architects.

Mechanical Engineers: for Lowell House, McKinlock Hall, Vanderbilt Hall–FRENCH & HUBBARD • for Dunster House, Littauer Building–RICHARDSON & GAY • for Aldrich Hall–HAYDEN, HARDING & BUCHANAN • for Gordon McKay Laboratory–R. G. VANDERWEIL.

Heating Contractors: for Lowell House, McKinlock Hall–CLEGHORN CO. • for Dunster House–T. J. MURPHY & CO. • for Vanderbilt Hall–JAS. S. CASSEDY, INC. • for Littauer Building–V. J. KENNEALLY CO. • for Aldrich Hall–THE MERRILL CO., INC. • for Gordon McKay Laboratory–McLEAN-COUSENS & BARTON, INC.

Oldest university in the U.S.A.

HARVARD

...another distinguished user of

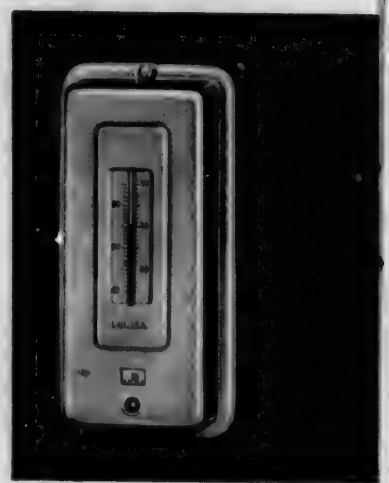
Above: LOWELL HOUSE

1

2

3

4



1 DUNSTER HOUSE, on the Charles River
2 MCKINLOCK HALL
3 VANDERBILT HALL
4 LITTAUER BUILDING

ALDRICH HALL Harvard Graduate School of Business Administration

One of the 17 unique classrooms shown at left seats 158 students; three others seat 90, and 13 accommodate 102 each. The rooms have been arranged to provide an intimate relationship between instructor and student in the give-and-take discussions by the case method generally used throughout the Harvard School of Business Administration.

Below: GORDON McKAY LABORATORY

Interior photo shows two-story room with important features, a high door and removable intermediate floor to permit varying uses. Research in this laboratory is conducted in mechanical engineering, electronics, electrical engineering and the properties of matter.

POWERS

AUTOMATIC SYSTEMS OF

Temperature Control

On the Harvard campus are to be found some of America's most beautiful buildings. A few of them which benefit from the maximum thermal comfort and fuel savings assured by POWERS control are illustrated here.

For more than half a century POWERS control has been renowned for its matchless ability to give many years of efficient economical service. Users often report 25 to 50 years of reliable control with a minimum of repairs.

Experience gained here and in thousands of other famous buildings qualifies POWERS to help you select the most economical and efficient temperature control for your buildings. When problems of temperature control arise, call our nearest office or write us direct.

THE POWERS REGULATOR COMPANY

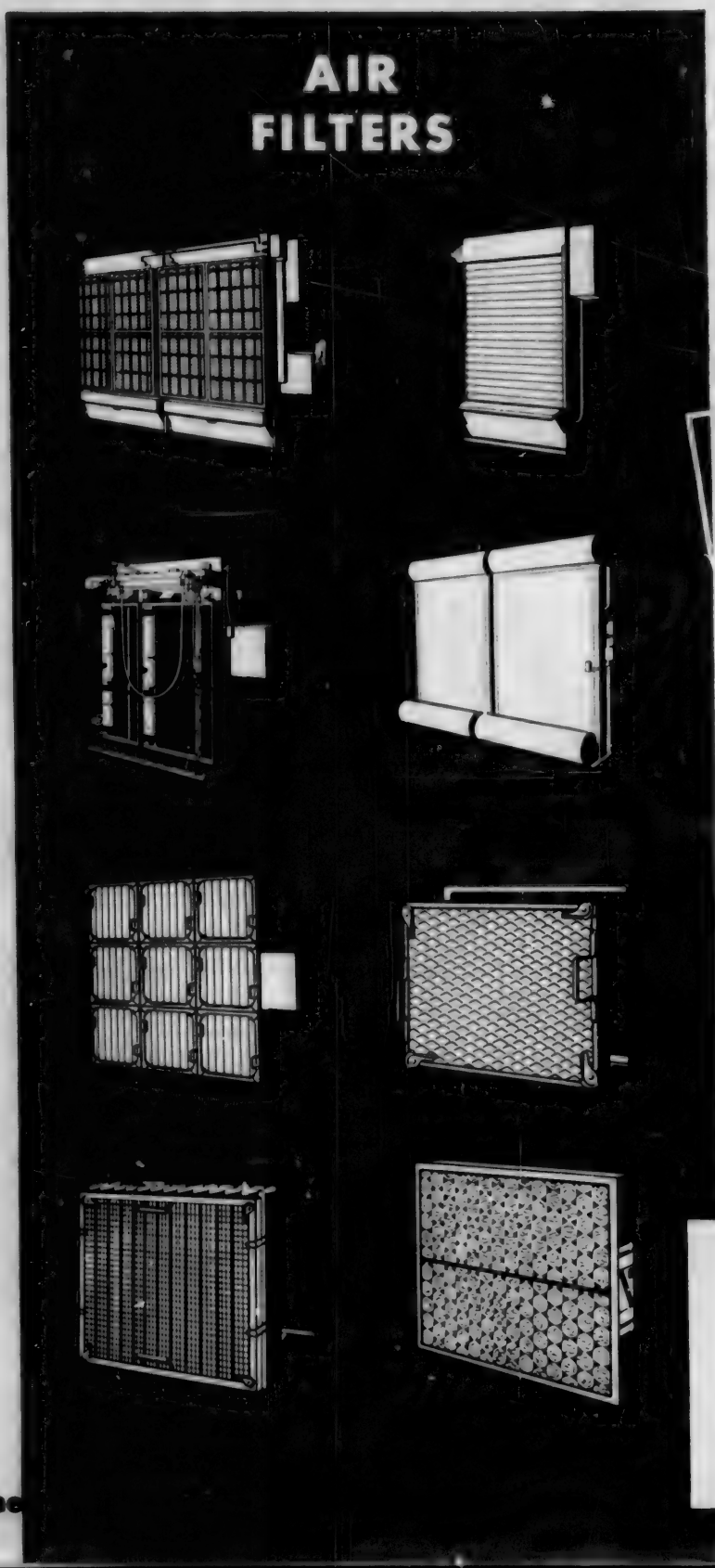
SKOKIE, ILLINOIS | *Offices in 60 cities in U. S. A., Canada and Mexico*

POWERS CONTROL

Over 60 years of Automatic Temperature and Humidity Control

(1-48)

AAF ANSWERS YOUR



FOR over 30 years, American Air Filter and its Herman Nelson Division have concentrated on making AIR a better commodity for home, school and industry. The products pictured here are only a portion of the complete AAF—Herman Nelson line. Each was developed to meet a specific need; solve a definite problem.

AAF's line-of-product approach to your air problems assures both coordinated planning and lower over-all costs. To avail yourself of this complete service, just call your local AAF representative. He is listed in your Classified Directory.

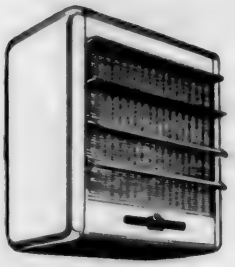
Let's Talk It Over in PHILADELPHIA!

A varied display of products plus a warm welcome from home office and field representatives awaits you at AAF Booths C116, 118, 122, 126 and 130.

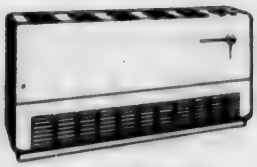
Heating and Ventilating Exposition
January 24-28

. . . pioneers in Air Care . cleaning, he

AIR PROBLEMS!



UNIT HEATERS
For Steam, Hot Water and Gas

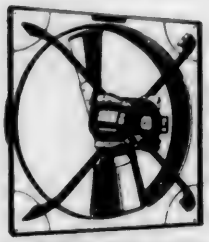


CONSOLE HEATERS

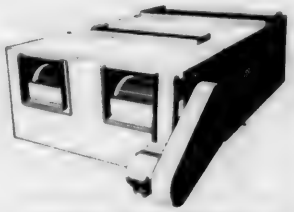
HEATING AND VENTILATING PRODUCTS

HERMAN NELSON
UNIT VENTILATORS

BELT & DIRECT DRIVE
UNIT BLOWERS

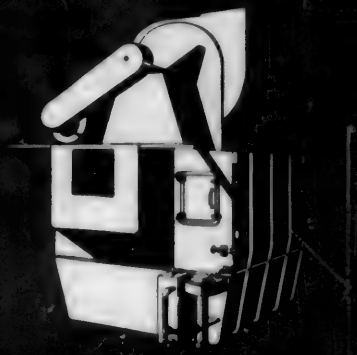


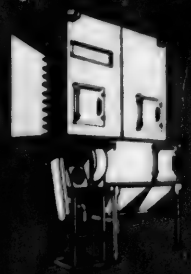
BELT & DIRECT DRIVE
PROPELLER FANS



HEATING AND VENTILATING
UNITS

DUST CONTROL EQUIPMENT

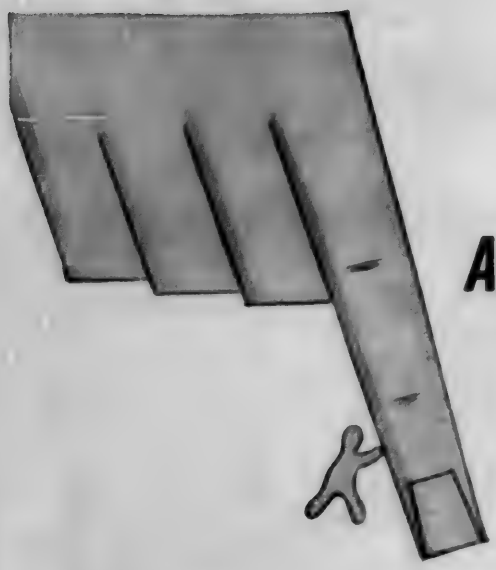




AAF
herman nelson

American Air Filter
COMPANY, INC.

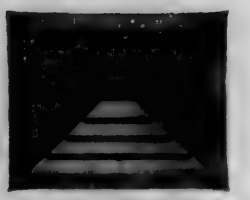
American Air Filter of Canada, Ltd., Montreal, P. Q. • 294 Central Avenue, Louisville 8, Kentucky



Put your finger on correct *AIR HANDLING* Equipment

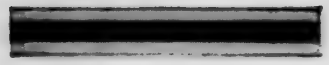
AGITAIR®

for better air

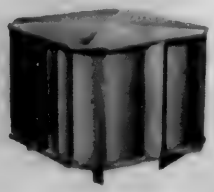


Square, Rectangular and Continuous Diffusers

Circular Adjustable and Non-Adjustable Diffusers



Stripline Sectional and Continuous Diffusers



Exhausters

High Velocity Air Filters

From drawing board to finished product, every AGITAIR is designed and built to provide dependable operation, maximum efficiency, minimum maintenance and years of continuous carefree service. And where AGITAIR engineering ends... AGITAIR technical service begins...to help you select the proper shapes and sizes to meet your particular requirements.

Contact your local AGITAIR representative — let him put your finger on the correct diffuser, filter or exhauster.

On Display at Booth 533

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

REZNOR'S new SECTIONAL Duct Furnace

- **Capacities to over 2,000,000 BTU**
- **Sectionalized to simplify installation**

Now you can design the *ideal* system for every duct heating situation — and be sure of the equipment to make it work. Reznor's sectionalized assembly (a completely new concept in duct heating equipment) means that installation problems no longer keep you from planning capacities up into the millions.

To provide a system of maximum efficiency at lowest cost, install one of these new furnaces as the heat exchanger with components for air moving, cooling, cleaning and humidification chosen to meet the requirements of the specific application.

New Reznor series DS sectional duct furnaces are assembled on the job out of four basic sections: 150,000 - 200,000 - 250,000 - 300,000 BTU. Capacities range upward in steps of 50,000 BTU from 150,000 to several million BTU. And because the new units are designed to handle large volumes of air with minimum pressure loss, capacities in excess of 2,000,000 BTU are often completely practical.

In addition to the revolutionary DS series, Reznor engineers have also perfected a completely new design for a series of small capacity duct furnaces. Though differing in construction from the DS series, the new series D models offer the same advantages of high efficiency, compact design and light weight. And they have the same adaptability to use in all custom engineered systems for comfort or process heating.

Suggestions on how to take advantage of Reznor's new concept — sectionalized assembly — plus complete details on construction and performance of the new units are included in two new bulletins. Because a Reznor duct furnace may be the key to the solution of any particularly difficult problem, you need to have these bulletins in your files. Use the coupon below to send for your free copies today.

SERIES DS — 150,000 to several million BTU

Each section is complete with controls and built-in draft diverter. Sections can be operated independently to meet less than peak load requirements. Burners are installed in a drawer which slides out the front of the unit to provide easy access for inspection and cleaning. All controls are attached to the burner drawer. Sections may be installed side-by-side in a single bank or back-to-back in a double bank. View above shows the 450,000 BTU model (one 150,000 BTU and one 300,000 BTU section assembled side-by-side).

SERIES D —
50,000 to 125,000 BTU

Reznor series "D" duct furnaces are designed primarily for residential and small commercial applications. Four sizes — 50, 75, 100 and 125,000 BTU. Handsome steel cabinets have burner access and controls completely enclosed on one side.

REZNOR MANUFACTURING COMPANY
64 Union Street, Mercer, Pa.

Please send me my free copies of Bulletins B-55-D and B-55-DS on your new duct furnaces.

NAME_____

TITLE_____

COMPANY_____

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REZNOR
THE WORLD'S LARGEST-SELLING GAS UNIT **HEATERS**

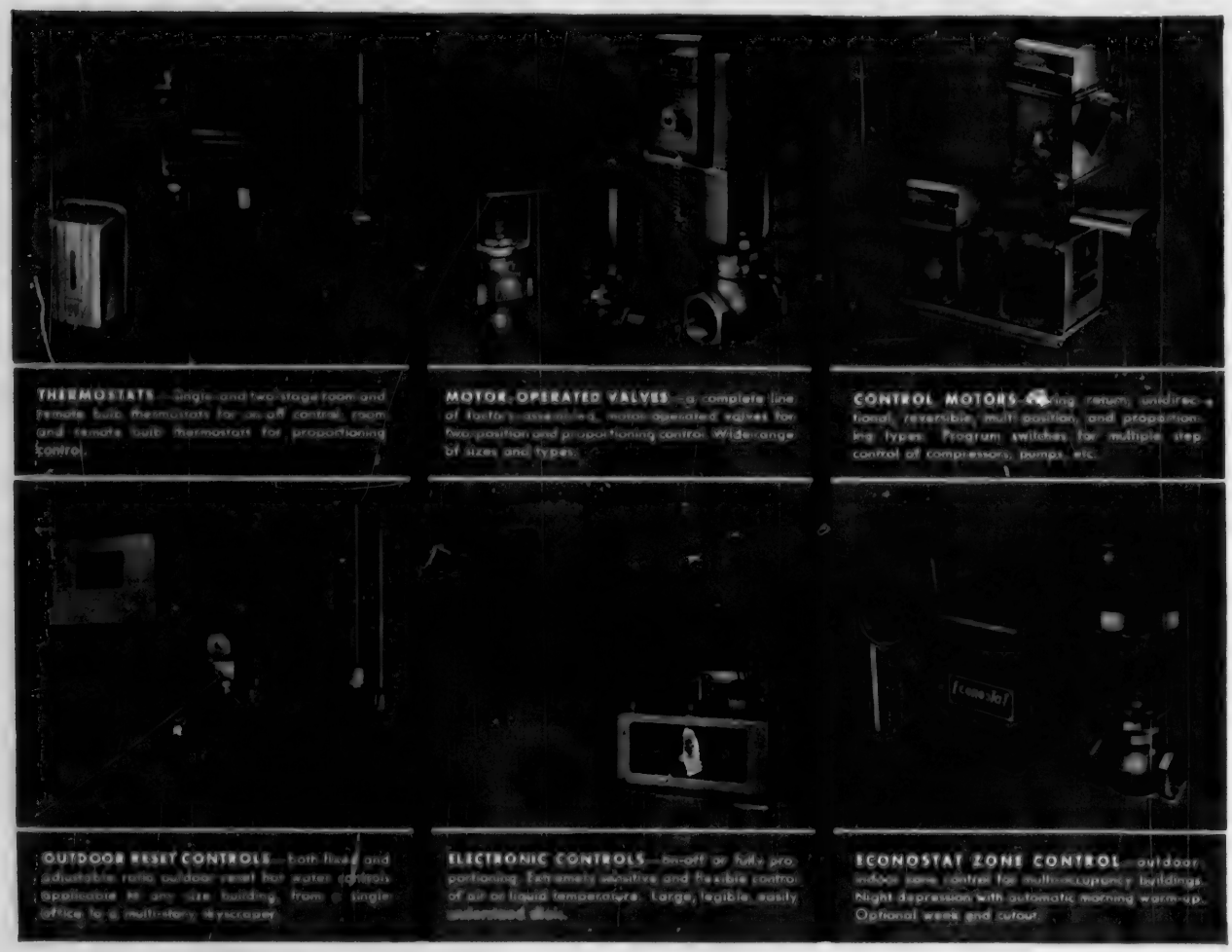
BARBER COLMAN

ELECTRIC-
ELECTRONIC

Automatic Controls

...better control
...electrically!

The swing is to electric and electronic controls for modern buildings ... and here's why! Remarkable sensitivity, plus the inherent positive positioning of proportioning controls, assure greater accuracy. Modern electric controls maintain temperature "right on the nose" night and day, for years on end. On zone jobs, outdoor sensing elements react to weather changes ... keep operating costs at a minimum. "Control Centers" slash costs of installation, checking, and servicing ... simplify layout of individual systems. Costs of long runs between systems are avoided, since power lines can be tapped practically anywhere. By installing wires in conduit, possibility of damage to control lines is eliminated, revisions can be made without tearing out walls, and quality of installation is above comparison. With the reliability of electrical devices proved in all aspects of our modern life ... and with ceaseless research marking important advances in electric controls ... no wonder the word is "*better* control ... electrically"!



THERMOSTATS—Single- and two-stage room and remote bulb thermostats for on-off control, room and remote bulb thermostats for proportioning control.

MOTOR-OPERATED VALVES—a complete line of factory-assembled, motor-operated valves for two-position and proportioning control. Wide range of sizes and types.

CONTROL MOTORS—spring return, unidirectional, reversible, multi-position, and proportioning types. Program switches for multiple step control of compressors, pumps, etc.

OUTDOOR RESET CONTROLS—both fixed and adjustable ratio outdoor reset hot water controls. Applicable to any size building, from a single office to a multi-story skyscraper.

ELECTRONIC CONTROLS—on-off or fully proportioning. Extremely sensitive and flexible control of air or liquid temperature. Large, legible, easily understood dials.

ECONOSTAT ZONE CONTROL—outdoor, indoor zone control for multi-occupancy buildings. Night depression with automatic morning warm-up. Optional week end cutout.

WANT MORE INFORMATION? Up-to-the-minute literature, complete with all necessary design data, is available on all Barber-Colman Automatic Controls, as well as on modern types of control systems. Call nearby Field Office, or write us for data bulletins on *your* project.

Shown here are just a few types of modern electric and electronic controls available from Barber-Colman. Our company has a remarkable background in design, engineering, and production of fine equipment ... our field staff has no peer in solving application problems. Come to us for answers to any questions about temperature control ... you'll get "*better* control ... electrically"!

BARBER-COLMAN COMPANY

Dept. N, 1302 Rock Street, ROCKFORD, ILL., U.S.A. • Field offices in principal cities

Automatic Controls • Air Distribution Products • Industrial Instruments
Aircraft Controls • Small Motors • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

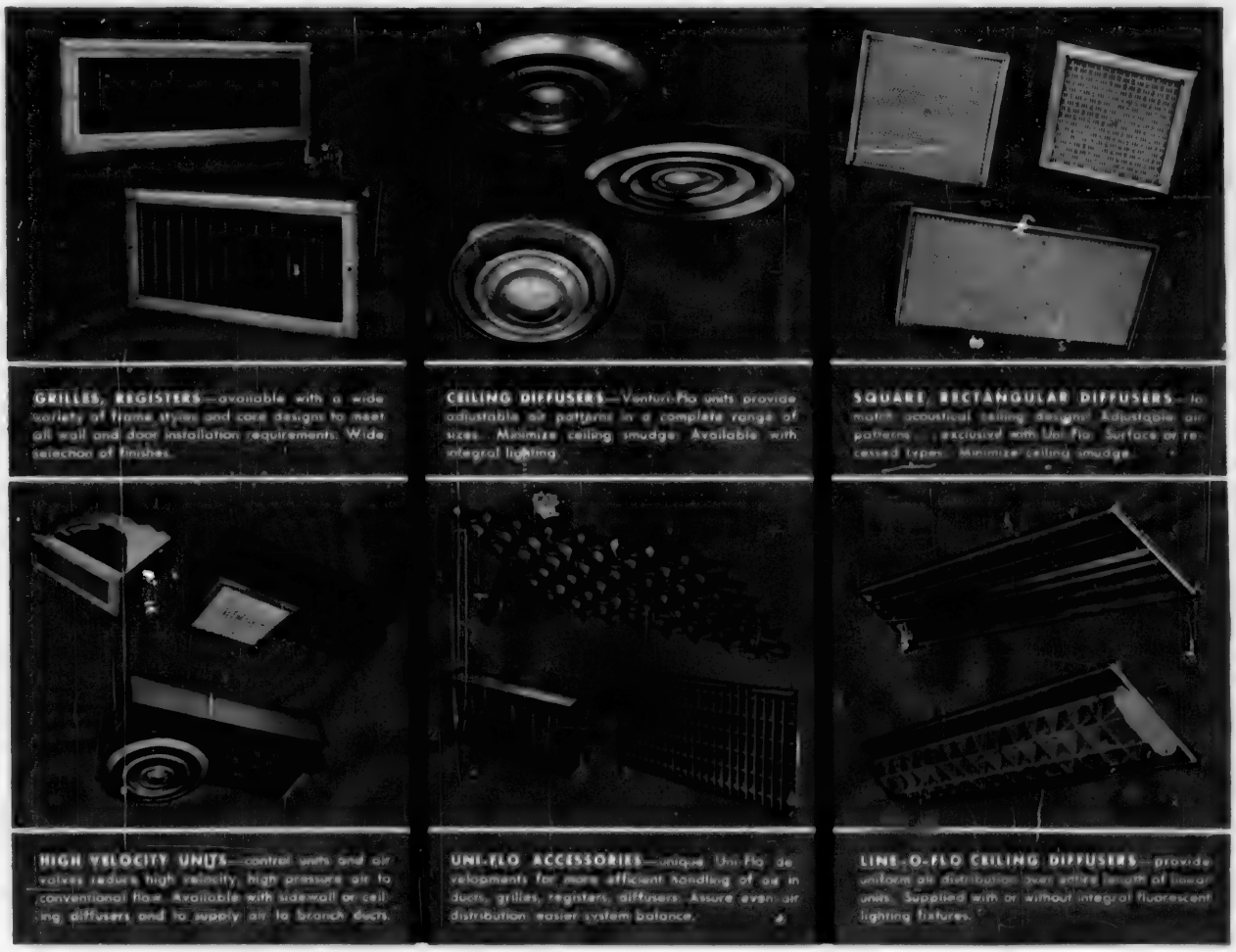
BARBER COLMAN

UNI-FLO ENGINEERED

Air Distribution

...modern, versatile ...for better jobs

What happens when conditioned air enters a room marks the difference between success and failure of a complete job. If there are drafts, uneven distribution, or noisy operation at point of room entry, the entire system is condemned. On the other hand, if air is delivered efficiently, unobtrusively, quietly, the whole job is lauded. The one way to write an insurance policy on satisfaction with each job is to specify the finest available air distribution equipment. Then you know you will get the best possible results from the entire system, free from troublesome and costly service calls. At the same time, you assure yourself of proved designs which are easier to install, harmonize beautifully with modern surroundings, last a lifetime. In the Uni-Flo line you get all these advantages, plus many exclusive developments. Choose from this wide selection:



GRILLES, REGISTERS—available with a wide variety of frame styles and core designs to meet all wall and door installation requirements. Wide selection of finishes.

CEILING DIFFUSERS—Venturi-Flo units provide adjustable air patterns in a complete range of sizes. Minimize ceiling smudge. Available with integral lighting.

SQUARE, RECTANGULAR DIFFUSERS—to match acoustical ceiling designs. Adjustable air patterns . . . exclusive with Uni-Flo. Surface or recessed types. Minimize ceiling smudge.

HIGH VELOCITY UNITS—control units and air valves reduce high velocity, high pressure air to conventional flow. Available with sidewall or ceiling diffusers and to supply air to branch ducts.

UNI-FLO ACCESSORIES—unique Uni-Flo developments for more efficient handling of air in ducts, grilles, registers, diffusers. Assure even air distribution, easier system balance.

LINE-O-FLO CEILING DIFFUSERS—provide uniform air distribution over entire length of linear units. Supplied with or without integral fluorescent lighting fixtures.

BLAZING THE TRAIL *TO BETTER AIR DISTRIBUTION*

When Barber-Colman entered the air distribution field, almost twenty years ago, we found meager and incomplete selection data. Up to then, rule-of-thumb methods were in common use. "Guesstimating" was accepted practice in determining sizes and proportions of the opening; the grille in most cases was added merely for decorative purposes.

In our research laboratory, every possible condition of air distribution was simulated. Results were tabulated and compiled into usable application data bulletins. Today, this time-proved information is used by architects, engineers, and contractors to determine exact requirements for each application.

From our research laboratory, too, come such outstanding "firsts" as opposed-blade volume control and air flow balancing devices; air turning equipment; adjustable ceiling outlets; high velocity air valves . . . to mention only a few.

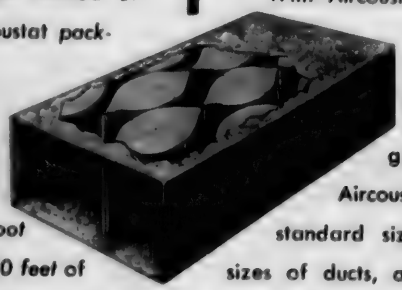
Today, Barber-Colman's certified data is available to you from our nearby Field Office. Phone or write us for information on any type of air distribution device, or for engineering help. Specify Barber-Colman and *be sure!*

BARBER-COLMAN COMPANY, Dept. M, 1102 Rock Street., ROCKFORD, ILLINOIS

Hear the difference...with Aircoustat

Here at last is a *practical, economical* method of quieting fan and air noises . . . Aircoustat *packaged silencing!*

Aircoustats are easy to install . . . fit directly into duct work. Result: you save time and money on installation costs. And results are amazing: one *7 foot* unit reduces noise level below what *100 feet* of duct lining could accomplish—with low pressure drop.



With Aircoustat, selection is no problem. This packaged unit is so engineered that if it fits geometrically, it fits acoustically. Constructed of galvanized steel or aluminum, Aircoustats are available in nineteen standard sizes for use with all styles and sizes of ducts, and in eight types to meet any desired conditions.

Industrial Sound Control, Inc. also manufactures cooling tower mufflers which end all threat of annoyance from fan or water noises . . . protect your installations from legal shut-downs based on anti-noise regulations. Write TODAY for complete information.

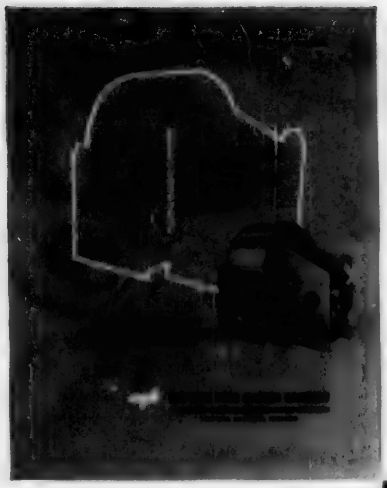
See and hear for yourself the advantages of Aircoustat at the Heating and Ventilating Exposition in Philadelphia Jan. 24-28.

SILENCE SERVICE

Industrial Sound Control Inc.

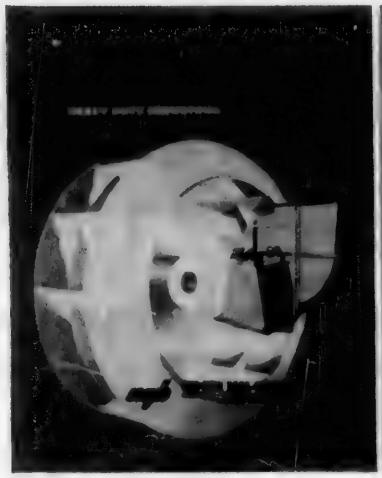
45 Granby Street, Hartford 12, Conn.

No. 543, Standard Duty Fans
Class I and Class II
No. 544, Heavy Duty Industrial Fans
Class II and Class III
No. 545, General Purpose Fans
Portable Self-Contained Units
No. 546, Forward Curve Fans
Class I and Class II



nyb new BULLETINS

Copies available for you at Booth 350
January Exposition, Philadelphia



A complete new series of centrifugal fans both forward curve and non-overloading (IPL), offering the latest in improved design, sturdy construction and quieter operation are now available.

Bulletins describing these fans with complete engineering data and capacity tables are now ready for distribution. Send for your copies today.

nyb THE NEW YORK BLOWER COMPANY
SALES OFFICES • 3165 SOUTH SHIELDS AVENUE • CHICAGO 16
FACTORY, LAPORTE, INDIANA

Fact:

NEW "Package" Precipitron Features Movable Nozzle Washing and Adhesive Application

2,000 to 10,640 CFM – 12 SIZES – ONLY 38 INCHES LONG

Another "First" from the Sturtevant Division of Westinghouse—the Type PC Precipitron—it's the "packaged" unit you have been looking for. An outstanding addition to the most complete line of air handling and air cleaning apparatus.

This remarkable unit features movable nozzle washing—the only successful and practical method of mechanical washing – and power adhesive spraying with movable nozzles. This eliminates need to open the unit or apply adhesive by hand. It may be mounted on floor, platform or ceiling, has built-in drain pan facilities, after filters and complete enclosure, including duct flanges.

Service is easy. The PC Precipitron has either right or left hand access through the side panel.

This compact PC Precipitron is ideal for use with air handling or air conditioning units, particularly in hospitals, retail stores, libraries and office areas. Equally applicable to industrial process requirements.

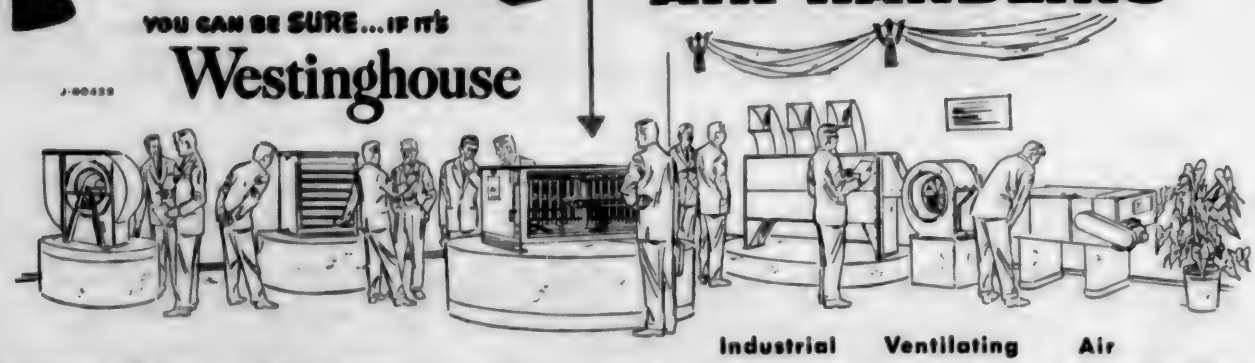
See this amazing unit at the A.S.H. & V.E. Show in Philadelphia. Or, call your Westinghouse-Sturtevant Sales Engineer . . . he is the "Man With The Facts" on air handling and electronic air cleaning.

Compact, easy-to-service PC Precipitron

WESTINGHOUSE AIR HANDLING

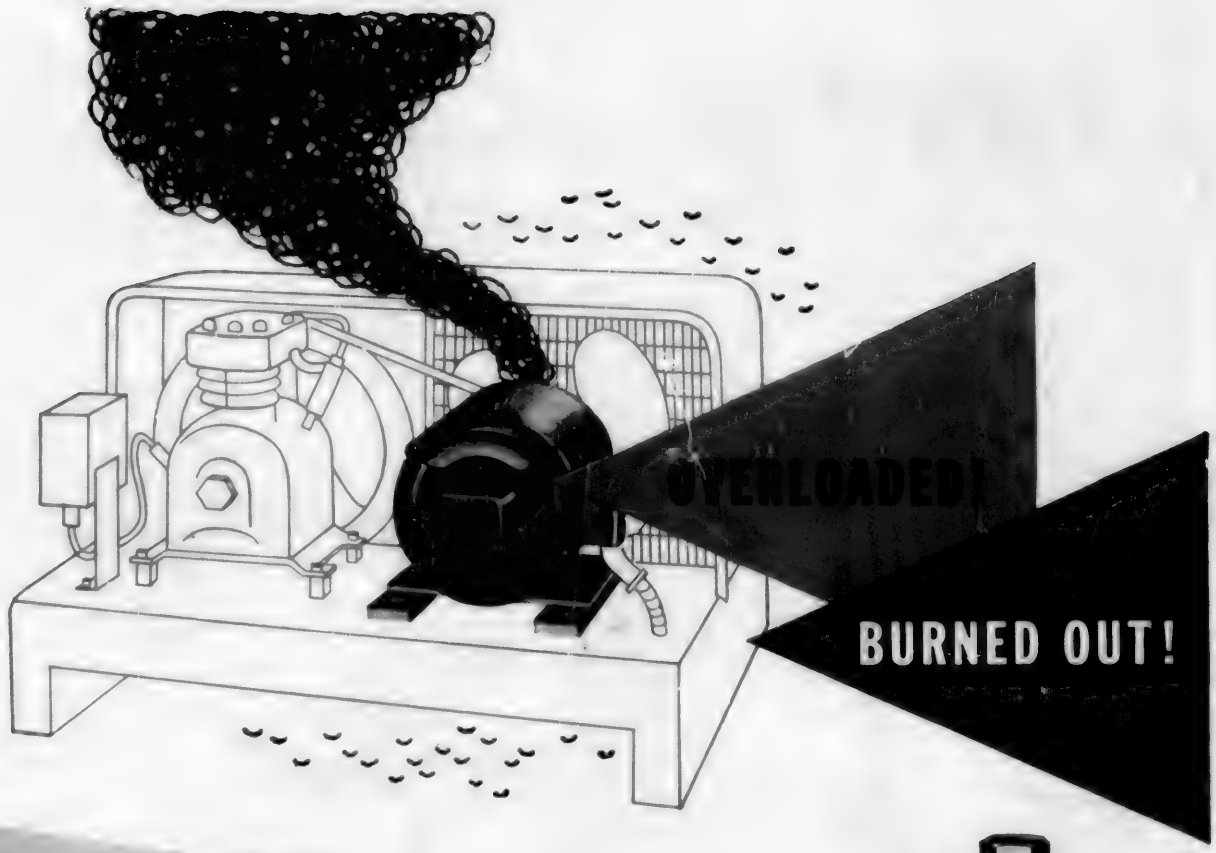
YOU CAN BE SURE...IF IT'S **Westinghouse**

J-60459



Silentvane Fan | Speedheater | PC Precipitron | Industrial Heater | Ventilating Set | Air Handling Unit

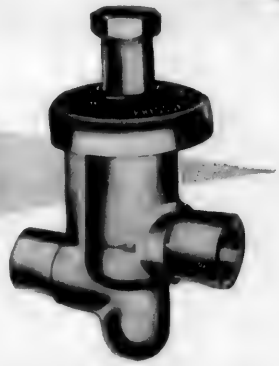
SEE IT AT THE A.S.H. & V.E. SHOW! January 24 thru 28, 1955 Here's where you'll find the new PC Precipitron, with its exclusive features. Booths 540-544.



this motor could have been saved with an ALCO SUCTION PRESSURE REGULATOR

TYPES 771-772

ENGINEERED FOR SERVICE FOR LIFE



Any electric motor is safe from burnout caused by overloads . . . if you install an Alco 771 or 772 in the suction line.

They prevent a build-up of excessive pressure at the compressor—add years to motor life—on any system that may be affected by:

- high starting loads
- surges in suction pressure due to load changes
- high suction pressure from hot gas defrost
- prolonged operation at excessive suction pressure
- low voltage and high pressures

SEND FOR BULLETIN 186, WHICH GIVES COMPLETE INFORMATION.

SEE YOUR ALCO WHOLESALER

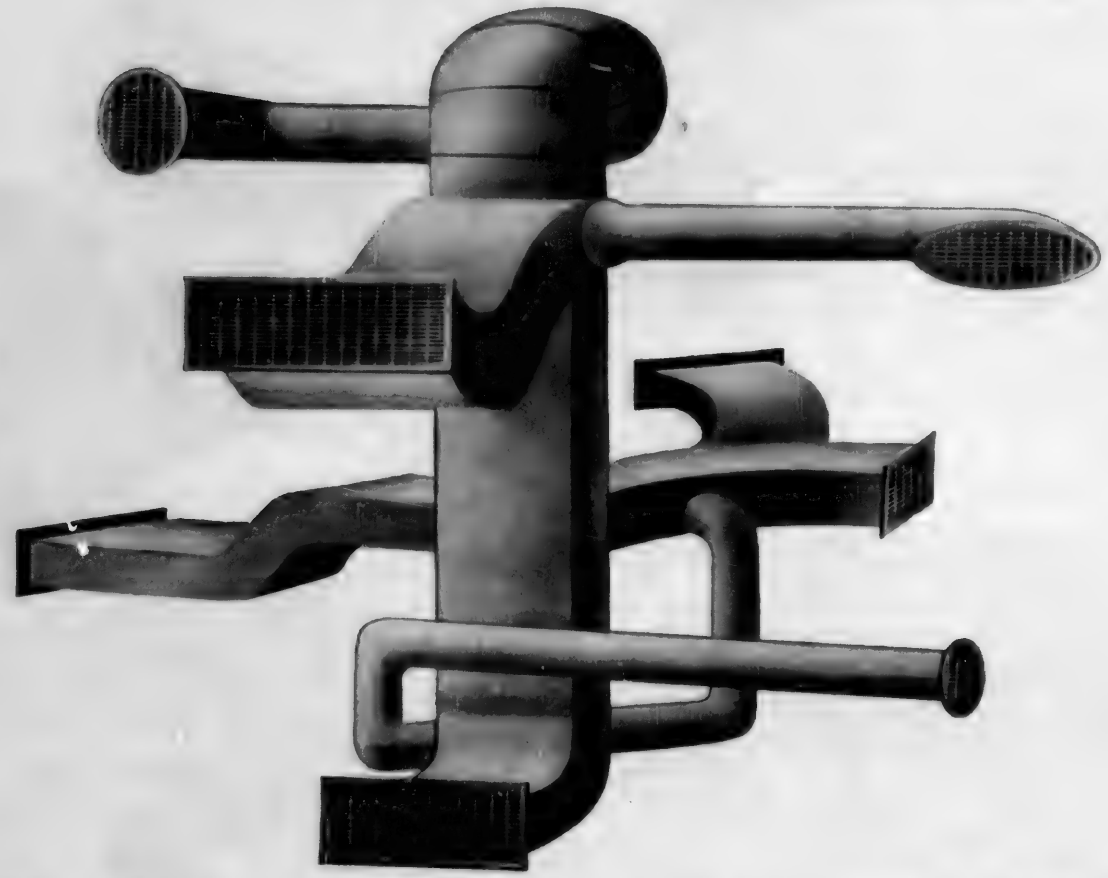
ALCO VALVE CO.

859 KINGSLAND AVE. • ST. LOUIS 5, MO.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

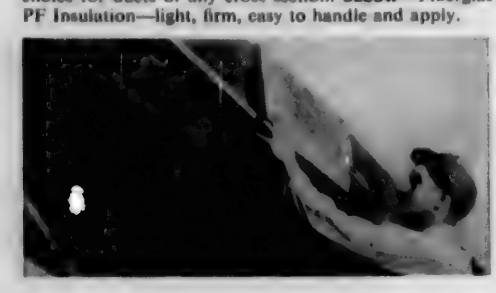
6318

Even if ducts were made like this... Fiberglas could insulate them!



The right product at the right price for every installation

ABOVE—Fiberglas Flexible Duct Insulation—the popular choice for ducts of any cross section. **BELOW**—Fiberglas PF Insulation—light, firm, easy to handle and apply.



If you need an insulation that can cover every shape of duct—round or rectangular—on inside as well as outside surfaces, specify Fiberglas*, made in a form for every purpose. And in addition, Fiberglas insulation gives you all these *plus* advantages:

- Exceptional lightness that eliminates need for extra supports
- Unexcelled thermal efficiency in all forms
- Labor-saving, cost-saving ease of application
- Acoustical properties when noise is a factor
- Wide range of densities, sizes and thicknesses
- Dimensional stability—no shrinking, swelling or buckling
- A rot-proof, moisture-resistant material

You should have full technical data on the world's most popular duct insulations. See our listings in Sweet's File, Chemical Engineering Catalog, or Refinery Catalog—or write to: Owens-Corning Fiberglas Corporation, Dept. 41-A, Toledo 1, Ohio.

A FORM FOR EVERY PURPOSE

PF • VAPOR-SEAL
COATED • FLEXIBLE
FLEXIBLE LINER

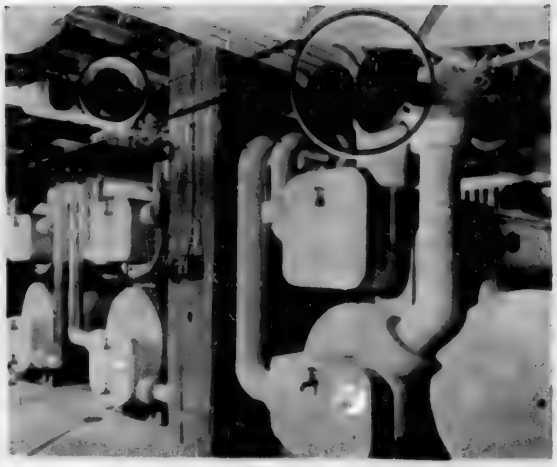
OWENS-CORNING FIBERGLAS

*T. M. Reg. Owens-Corning Fiberglas Corporation

JOHNSON-CONTROLLED HEAT PUMP **CUTS COSTS** IN HALF!

The Equitable Building, Portland, Oregon. J. Donald Kroeker, engineer; Pietro Belluschi, architect; P. S. Lord, contractor, all of Portland.

Johnson Control panels permit the operation of the system to be observed from central locations.



Johnson valves in command at the Trane turbo-vacuum compressors.

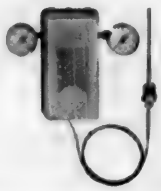
This world famous heat pump installation provides air conditioning for Portland's Equitable Building at less than half the average combined heating-cooling costs of other office buildings! Solving the many intricate control requirements of the heat pump and responsible for operating the system in the most efficient manner possible is a specially designed system of Johnson Automatic Control.

Year 'round air conditioning demands—usual or unusual—present no problems! *All* are controlled with precision. The whole system is the result of perfect planning . . . and this "reverse cycle" system is completely automatic. There are no definite transition points between the various cycles of operation: (1) when the demand for heating is greater than that for cooling; (2) when the need for cooling exceeds that for heating; (3) when there is a demand for cooling only. The unique control features of this interesting air conditioning system are made possible by the superior control characteristics of the highly accurate "T-900 Series" of Johnson Thermostats.

Why not cut your costs, too? Whether your temperature regulation problems demand this kind of intricate control system or a very simple arrangement of thermostats and valves or dampers, look to Johnson for the best solution. A nearby Johnson engineer will gladly make recommendations without obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

FEATURES OF JOHNSON CONTROL IN THE EQUITABLE BUILDING

The building is divided into heating and cooling zones. Most floors are arranged to provide 11 zones. Each zone is controlled separately by a Johnson Room Thermostat.



Johnson T-900 Outdoor Master Thermostats measure the external heating and cooling requirements and limit the amount of refrigeration capacity which can be brought into operation at less than design load. This reduces the electric power demand charges to the lowest possible minimum.

Refrigeration capacity is controlled by a Johnson Pneumatic Step-Controller, operated from Johnson Thermostats which measure the heating and cooling demand. The number of refrigerating compressors in operation, at any time, is determined by whichever demand (heating-or cooling) is greater.

Water temperatures are varied continually for heating and cooling. Automatic control is accomplished by Johnson T-901 Submaster Thermostats commanded by a Johnson T-900 Master Thermostat which measures outdoor temperature.

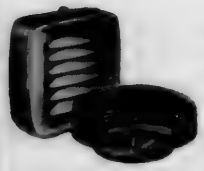
JOHNSON CONTROL

TEMPERATURE AIR CONDITIONING

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885

YOU name the heating job . . .

STEAM

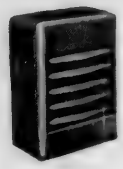


Modine builds 13 sizes of vertical delivery units with choice of 5 easily attached optional deflectors. Horizontals in 19 standard and low-outlet temperature models.

HOT WATER

Your choice of 13 vertical delivery units with 5 easily attached deflectors. Five sizes of horizontal models, designed specifically for hot water.

GAS



Only Modine gas-fired units have stainless steel burners and a choice of stainless or aluminized steel heat exchangers. Seven sizes — 25,000 to 220,000 Btu.

Modine offers the unit heater to do it better . . . at lower cost

Compare Modine steam and hot water units with all other makes

For over 25 years, Modine has paced the field in unit heating. Every model provides perfect heating comfort plus lowest possible fuel cost. This balanced heating is the result of the discharge temperatures of 110 to 120° F being correctly related to heat throw and air volume. For the complete story, see the Modine representative listed in your classified telephone directory, or write today for Bulletin 154.

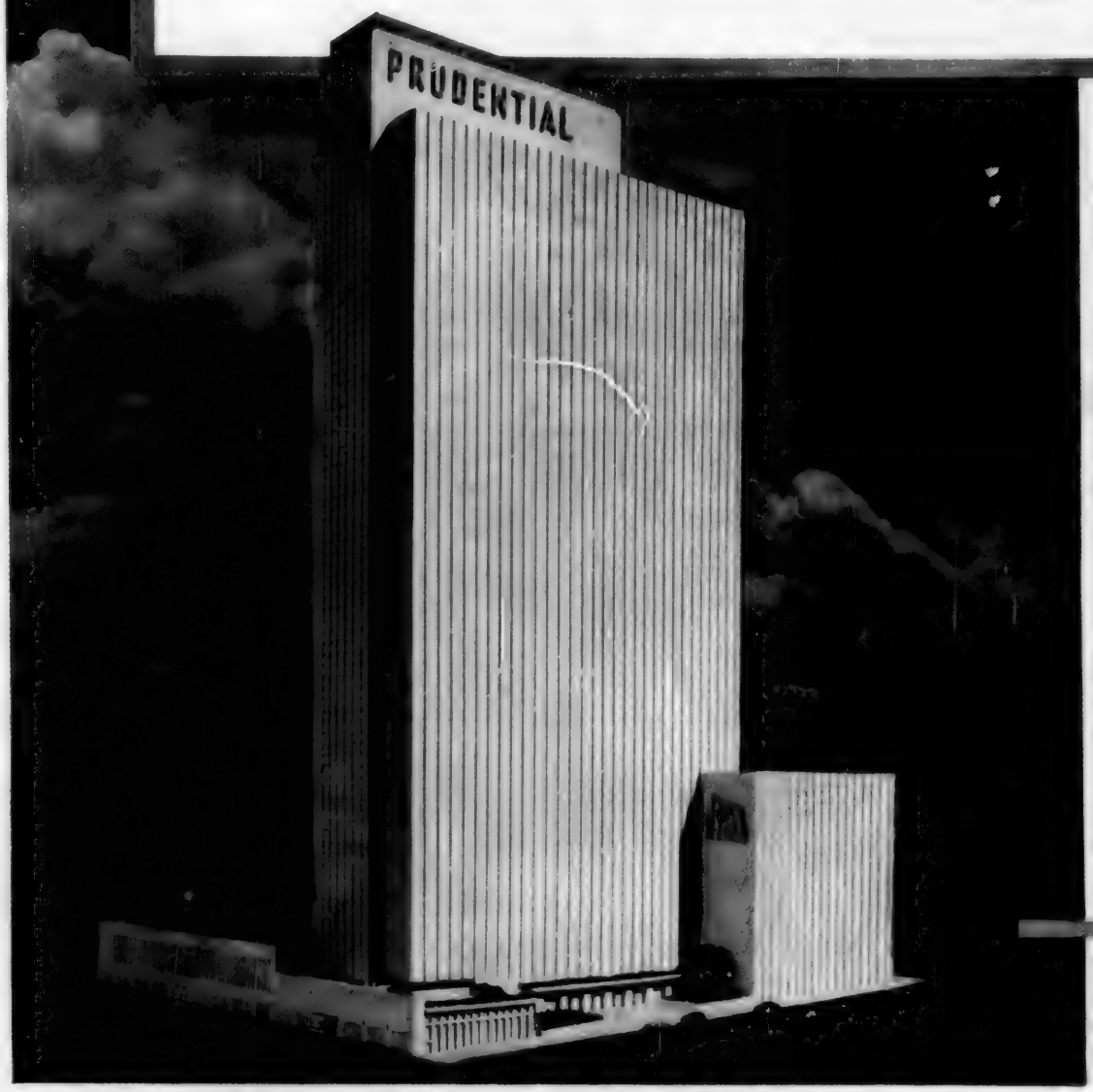
Modine gas-fired unit heaters cost less to install, less to operate

In addition to greatly extended life, Modine Gas-Fired Unit Heaters cost less to install. That's because they're only half the weight, half the size of other leading units. And this lighter weight—coupled with direct firing of tubes and reduction of heat exchanger mass—gives you heat within 5 seconds of thermostat's call. Write for Bulletin 654. Modine Mfg. Co., 1511 DeKoven Avenue, Racine, Wisconsin.

U-1247

Modine UNIT HEATERS

Honeywell Electronics will save thousands of dollars in the world's most modern building

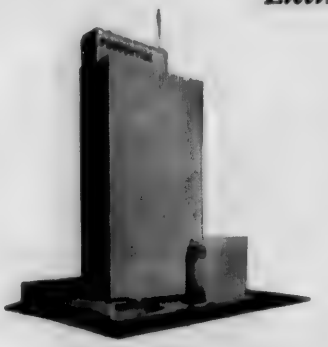


Model of the Mid-America Home Office of The Prudential Insurance Company now under construction in Chicago. Architects and Engineers: Naess & Murphy, Chicago. General Contractor: George A. Fuller Co.; Air Conditioning and Refrigeration Contractor: William A. Pope Co.; Heating Contractor: H. P. Reger & Co.; Ventilating Contractors: R. B. Hayward Co. and Jamar-Olmen Co.; Electrical Contractors: Pitchbach, Moore and Morrissey, Inc., Emerson-Comstock Co., Inc., J. Livingston & Co., Air Conditioning by Carrier Corporation. Rental Agent: L. J. Sheridan & Co., Chicago.

Continued from preceding page

Honeywell Electronic Air means impressive

Electronic Controls will save thousands of dollars



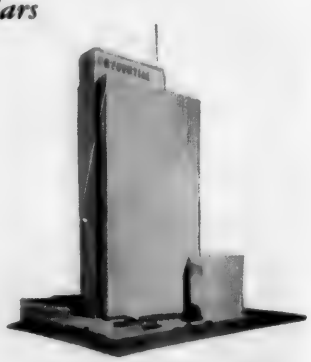
Without Honeywell Electronic Control

203

CHECK POINTS

203 points would have to be checked and adjusted at the individual control sites.

Heart of the electronic master control system will be a basement control panel. From this one location a trained operator can read and adjust the setting of 203 master electronic thermostats—all *remotely*. These thermostats will be located on the water, primary air, cooling and heating systems. It is estimated the integration of the control system with the electronic controls and panels will eliminate 2 degrees of overheating, 2 degrees of overcooling and make checking, calibrating and maintenance easier, simpler, and considerably less expensive. This will make possible an annual saving of thousands of dollars in maintenance and operation.



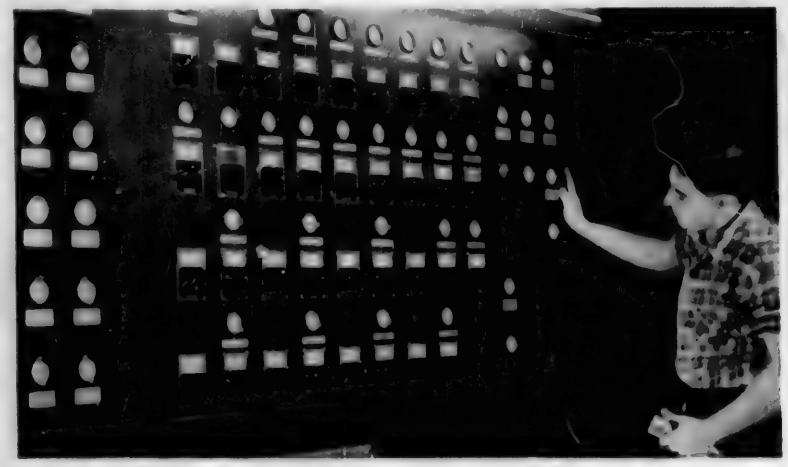
With Honeywell Electronic Control

1

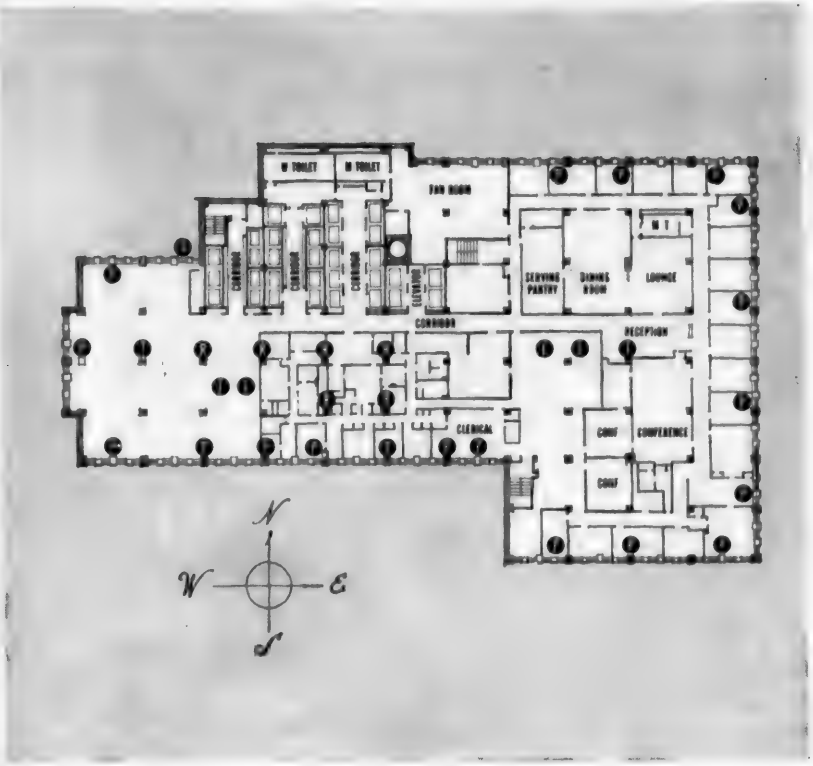
CHECK POINT

An operator at a panel in the basement will be able to check and *adjust* all 203 stats remotely.

From a single control panel in the basement (a typical panel is shown here), an operator will check and *adjust* the indoor weather throughout the huge building. He'll do it by pushing a button to check, and moving a knob if adjustment is necessary. Development of electronic controls has made such scientific control possible. Only from Honeywell can you obtain the electronic controls and the instrumentation to provide such performance.



Conditioning Control
economy of performance, maintenance



T ELECTRONIC INDICATION
P PNEUMATIC UNIT THERMOSTAT
E ELECTRONIC DUCT THERMOSTAT
R ELECTRIC ROOM THERMOSTAT
O OUTDOOR ANTICIPATOR

Strategic location of thermostats is indicated by the letters on the floor plan. "E" stands for electronic, "P" for pneumatic, "R" for electric and "T" for electronic indicating thermostat.

The function of the electronic controls is explained on the left hand page.

The pneumatic *room* thermostats you see here will guard comfort in individual offices around the perimeter of the building. The electric thermostats will control temperature in inner offices. The electronic indicating thermostats will be connected to the basement control panel.

OFFICE BUILDING comfort and efficiency will come of age—*electronic age*—when the huge new Mid-America Home Office building of The Prudential Insurance Company of America is completed in Chicago.

For super-sensitive electronic air conditioning controls will mastermind the ideal indoor weather to be provided throughout the building by Honeywell Customized Temperature Control.

These electronic controls, developed by Honeywell after years of research and testing, are far more sensitive than ordinary controls. Yet they're far simpler in construction, have no moving parts to get out of order.

Over a period of just a few years electronic master controls in the Prudential building will pay for themselves—at an estimated yearly rate of saving of 27% of the original cost. How this saving will be made is explained at left.

As in every building with Honeywell Customized Temperature Control, all controls in the Prudential building will be part of an integrated system.

All thermostats will play an important role in combatting use and occupancy comfort problems.

Another function these strategically placed thermostats will easily handle is exposure compensation. If the wind from Lake Michigan to the east is strong and cold, thermostats on that side will call for more heat. And when the summer sun beats down on the south face of the building, thermostats *there* will call for more cooling.

Of greatest significance, however, to the future of comfort controls in the buildings of America is the *electronic* phase of the Prudential installation. It will set the pattern for years to come.

The Electronic Temperature Control story of the new Prudential building continues on the next page

Continued from preceding page

Honeywell Electronic Air Conditioning Control for the new Prudential building in Chicago

Here are the thermostats that will be used

Room Thermostat. This is the famous Honeywell Pneumatic Grad-U-Stat. It will control both heating and cooling in rooms of the 41-story Prudential building. Visible on the wall, it will allow tenants and employees to adjust the temperature to meet particular *room* conditions. To see how these thermostats will be located, refer to the floor plan on the preceding pages.

Electronic Thermostat. This is the electronic thermostat that will be used in the Prudential building. Two-hundred seventy-six will be installed in the master control system. Of this number, 203 will be *adjustable from the control panel*. These stats—which will be located inside duct work, and therefore not seen by tenants—are ⅓ the size of conventional stats, yet are many times more sensitive.

For the finest, most modern temperature control in new or existing buildings—of any size—use Honeywell Electronic Temperature Control

Whether it's an office building, shopping center, factory, motel, hospital, school—or any size building—new or existing, Honeywell Electronic Temperature Control can help you give your clients the finest control in the world.

This includes control of heating, ventilating and air conditioning. And it includes control of processing—to help make industrial clients' operations more efficient.

Your clients will not only enjoy more comfort and efficiency, they'll save fuel, too.

For full facts on Honeywell Electronic Temperature Control, and how it can help meet *your* problems, call your local Honeywell office.

MINNEAPOLIS **Honeywell**

Electronic Controls

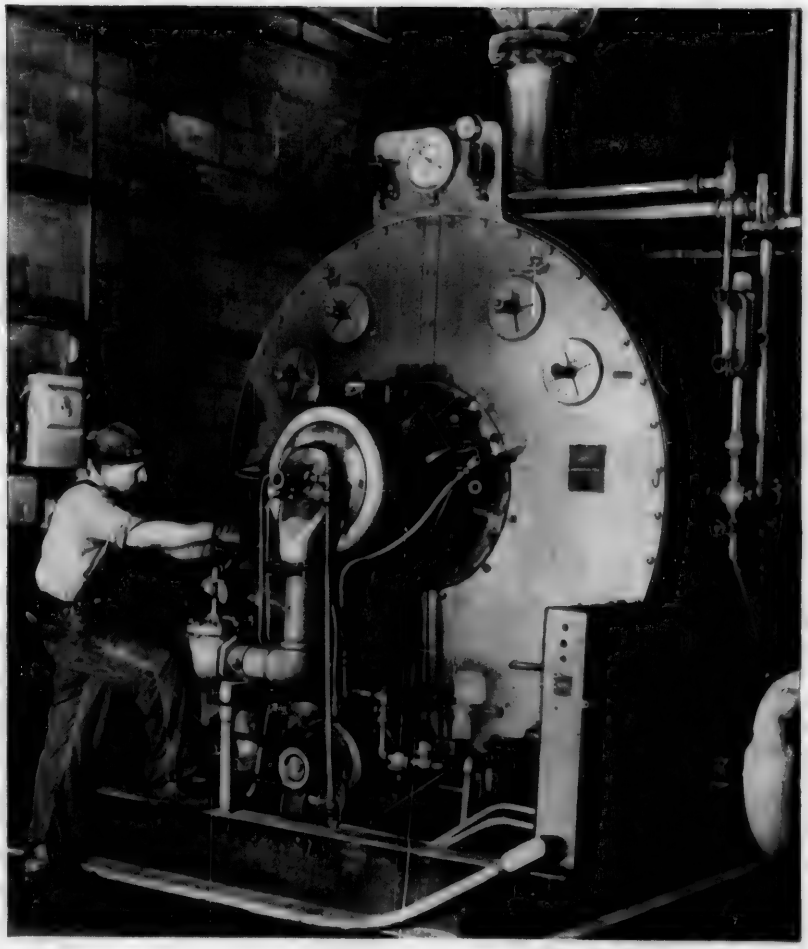
112 OFFICES ACROSS THE NATION

BALDOR MOTORS

Under the auspices of the American Society of Heating and Ventilating Engineers

Write now for advance registration: International Exposition Co., 480 Lexington Ave., New York 17, N. Y.

IN MEAT PACKING PLANTS...



Powermaster® Performance Pays Off

FOR EXAMPLE: Continuous satisfaction with the performance of a 150 HP *Powermaster* purchased several years previously led to the addition of this 250 HP gas-fired *Powermaster* at a Mid-West meat packing plant.

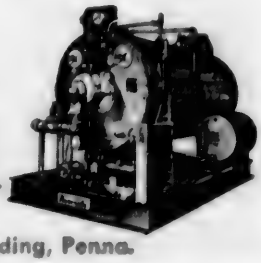
Savings with *Powermaster* Packaged Automatic Boilers start with their compact, simplified installation. No special foundation or costly stack is needed. As delivered, *Powermasters* are completely factory assembled and factory fire-tested, fully equipped and wired ready for operation as soon as fuel, electric and flue gas connections are made.

Once installed, *Powermasters* keep right on saving. High fuel economy at all loads, dependable performance, time-saving attention, maintenance-saving accessibility, automatic operating and safety controls, smokeless combustion, and hospital-clean operation ... these are reasons steam costs go down where *Powermasters* go in.

To keep your steam costs in line... compare *Powermaster,* and you'll see why it is so widely used in all kinds of food processing plants. Send NOW for new bulletins on *Powermaster's* cost-saving advantages.

O·S *Powermaster*® **PACKAGED AUTOMATIC BOILERS**

In sizes to 500 HP; pressures to 250 psi.



ORR & SEMBOWER, INC.

Morgantown Road, Reading, Penna.

when the job is to
CHILL WATER*
plan it with Acme

* or other liquids

Acme DRY-EX® LIQUID CHILLERS
with thru-tube construction

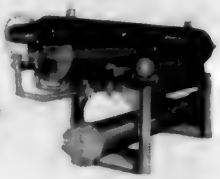
. . . the original direct expansion type liquid chiller . . . field proven in 17 years of continuous, trouble-free service . . . deliver full capacity as rated.

. . . most efficient
. . . most dependable
. . . most compact
and they're cleanable

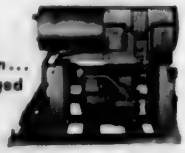
Acme PACKAGED LIQUID CHILLERS and HEAT PUMPS

. . . simplify engineering . . . save installation time and costs . . . do a better job . . . take less space.

FLOW-THERM®
15 thru 275 tons



FLOW-COLD
2 thru 15 tons . . .
the original...the proven...
the most copied packaged liquid chiller.



when the problem is to
SAVE WATER
solve it with Acme

2 thru 20 tons for residential and smaller commercial installations

Acme ALL-METAL COOLING TOWERS

7½ thru 150 tons for [illegible] industrial applications

92½% water savings . . . all metal, completely galvanized — no wood to rot, nothing to rust or corrode . . . blowers on All models [illegible] provide [illegible] assure quiet operation indoors or outdoors . . . with or without [illegible] Always Acme wetted metal deck for fastest heat transfer, most compact size.

for top system
efficiency always
USE WATER*
and specify Acme

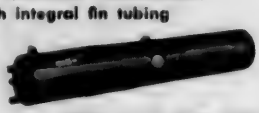
* still the best medium for economical heating and cooling.

Acme CONDENSERS
THE STANDARD OF THE INDUSTRY

Because of their pace-setting quality and superior design, Acme condensers have been preferred by leading manufacturers of air conditioning and refrigeration equipment for years. You can depend on Acme condensers to deliver full capacity as rated and give the maximum of trouble-free service.

SMALL TONNAGE CONDENSERS
with integral fin tubing

SHELL AND TUBE TYPE
½ thru 30 tons



SHELL AND COIL TYPE
¾ thru 7½ tons

LARGE TONNAGE CONDENSERS

FOR FREON OR AMMONIA
capacities up to 300 tons

SEE US IN SPACE 501 CONVENTION HALL

ACME INDUSTRIES, INC.
JACKSON, MICHIGAN, U.S.A.
Manufacturers of Quality Air Conditioning and Refrigeration Equipment since 1914

12th International Heating and Ventilating Exposition, Philadelphia, January 24-28

DETROIT ROTOSTOKERS

Are To Be Used To Efficiently

Fire The Boilers In

The New Prudential Mid-America

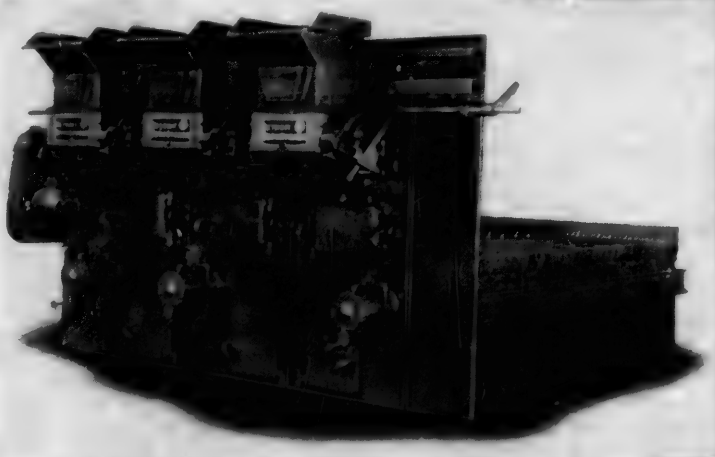
Home Office Building—Chicago

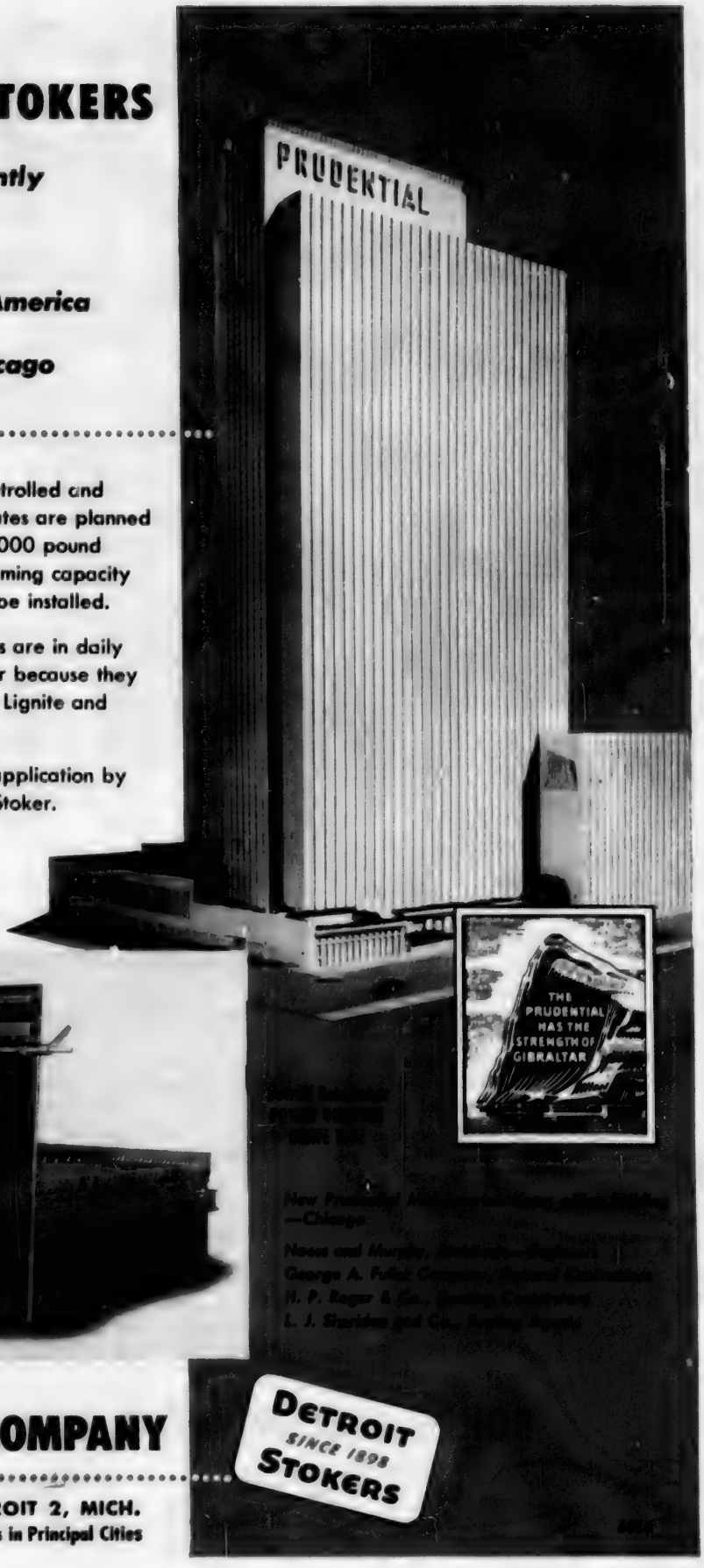
Detroit RotoStokers, automatically controlled and having Power Operated dumping grates are planned to burn southern Illinois coal. Two 40,000 pound and one 22,000 pound per hour steaming capacity Erie City Steam generating units will be installed.

Many hundreds of Detroit RotoStokers are in daily operation in prominent plants. Popular because they successfully burn all Bituminous Coals, Lignite and also wood and other refuse fuels.

Buy a stoker for proper design and application by experienced builders. Buy a Detroit Stoker.

Write for a catalog. No obligation.



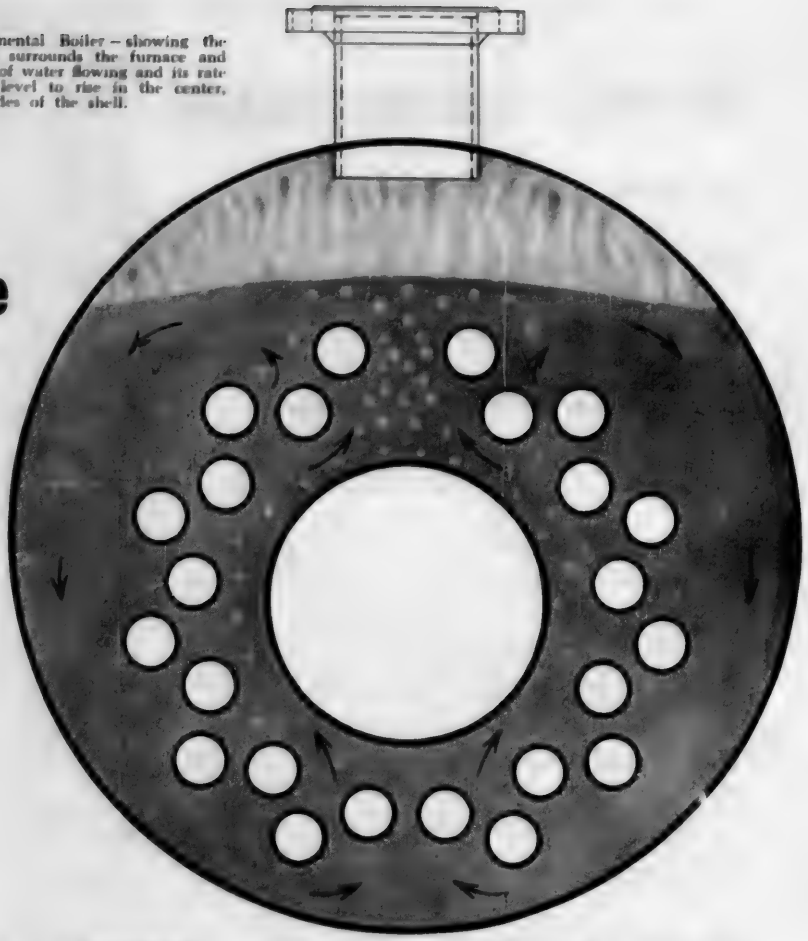


DETROIT STOKER COMPANY

GENERAL MOTORS BLDG., DETROIT 2, MICH.
Works at Monroe, Mich. • District Offices in Principal Cities

DETROIT SINCE 1898 STOKERS

Cross-section of a Continental Boiler – showing the free flow of water which surrounds the furnace and return tubes. The volume of water flowing and its rate of flow cause the water level to rise in the center, then fall away to both sides of the shell.



What makes the Continental Boiler last longer... makes steam cost less

If you were to design a packaged boiler, water circulation would be a basic consideration because . . .

. . . poor circulation can cause overheating . . . can cause unequal stress in metal heating surfaces . . . can promote pitting and scaling on metal surfaces exposed to water . . . and can result in higher stack temperatures, decreased boiler efficiency.

But the many owners of Continental Boilers have had none of these troubles. Here are two special reasons why:

1. Two-pass design provides even flow of combustion gases to all heating surfaces.

Heat is thus distributed evenly to the rear tube-sheet and to all of the return tubes. Water is heated uniformly, and natural, balanced circulation results.

If high temperature combustion gases were to enter only one section of the return tube bank, the tubes in that section would be at a higher temperature, would be doing more work than the balance of the tube-sheet and return tubes. The result: water surrounding those cooler heating surfaces would have sluggish circulation.

2. Heating surfaces in the Continental Boiler are arranged so that there is a centrally located furnace and equal spacing of return tubes.

Of the total heat transferred to the water within a Continental Boiler, about 60% is transferred by the furnace. Thus it is essential that flow of water around the furnace be unrestricted. Note the area around and above the furnace and the open channel along both sides of the boiler shell. This design assures unrestricted flow of water around the furnace . . . facilitates rapid flow of water to the bottom of the boiler for reheating.

Uniform . . . free . . . rapid water circulation is an important reason why a Continental Boiler costs little to keep, has long service life, and makes steam cost less. For detailed information write for Bulletins BE-3, BE-4.

BOILER ENGINEERING & SUPPLY COMPANY, INC.

Phoenixville, Pa.

CONTINENTAL . . .
the boiler with the spinning gas technique

SAVES TIME!

Chase® Copper Tube for Soil, Waste and Vent Lines

means a neater, faster installation!

Save time on drainage installation—and final pressure-testing, too—with Chase Copper Tube and Solder-Joint Fittings.

Chase Copper Tube comes in long twenty-foot lengths, requires fewer joints, is light and easy to handle. What's more, it lets you pre-assemble entire sections . . . another timesaver!

Chase Solder-Joint Fittings do away with pipe-threading, eliminate the need for heavy, clumsy tools. With Chase Solder-Joint Fittings, it's *easy* to make a drainage system pressure tight *for good*, using standard soldering techniques.

Your nearest Chase Wholesaler has a complete stock of Chase Copper Tube and Solder-Joint Fittings. Call him before your next job!

Chase®

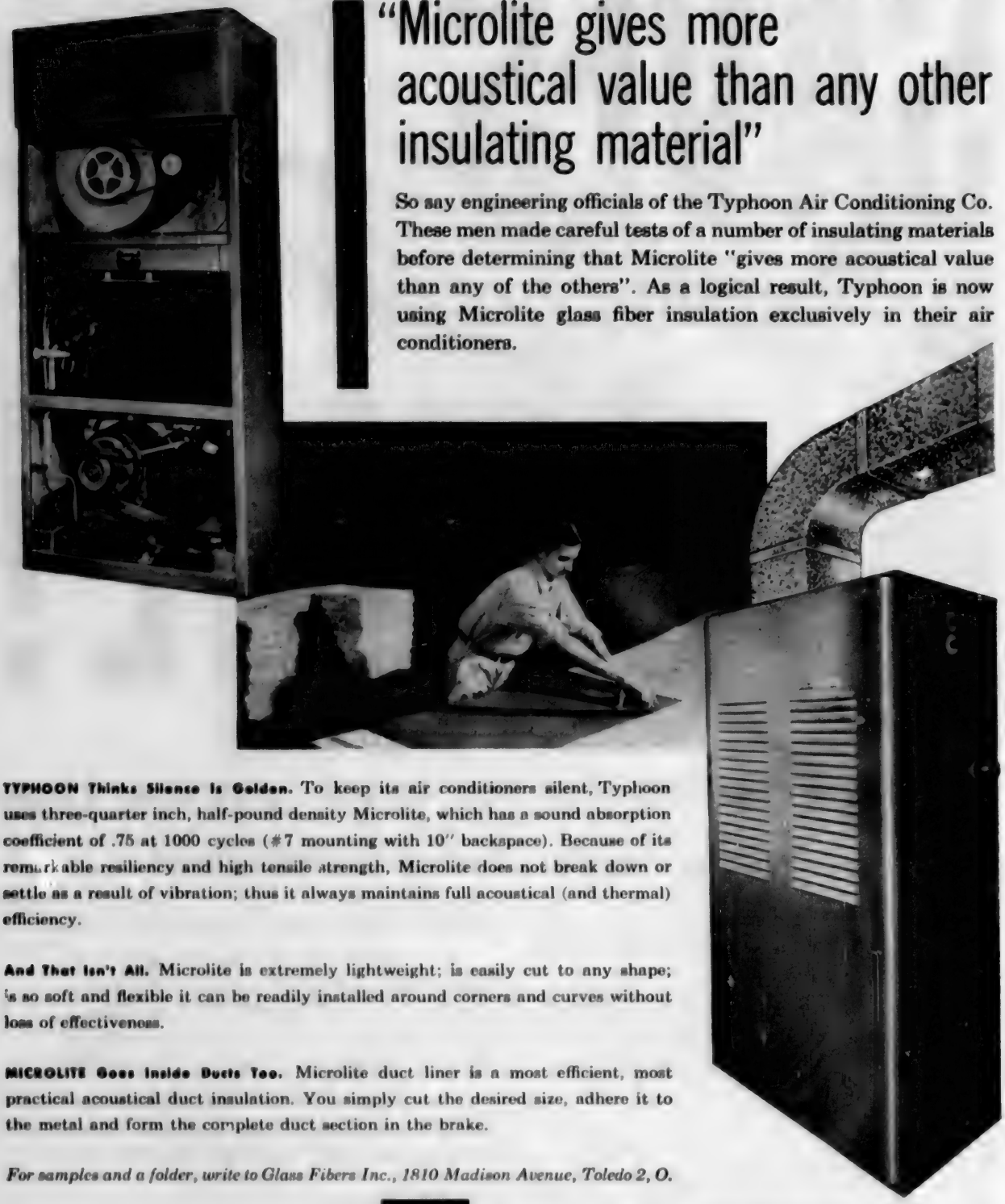
BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper (†sales office only)

Albany†	Chicago	Denver	Indianapolis	Minneapolis	Philadelphia	St. Louis
Atlanta	Cincinnati	Detroit	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Baltimore	Cleveland	Grand Rapids†	Los Angeles	New Orleans	Providence	Seattle
Boston	Dallas	Houston	Milwaukee	New York	Rochester †	Waterbury

TYPHOON uses MICROLITE because



"Microlite gives more acoustical value than any other insulating material"

So say engineering officials of the Typhoon Air Conditioning Co. These men made careful tests of a number of insulating materials before determining that Microlite "gives more acoustical value than any of the others". As a logical result, Typhoon is now using Microlite glass fiber insulation exclusively in their air conditioners.

TYPHOON Thinks Silence Is Golden. To keep its air conditioners silent, Typhoon uses three-quarter inch, half-pound density Microlite, which has a sound absorption coefficient of .75 at 1000 cycles (#7 mounting with 10" backspace). Because of its remarkable resiliency and high tensile strength, Microlite does not break down or settle as a result of vibration; thus it always maintains full acoustical (and thermal) efficiency.

And That Isn't All. Microlite is extremely lightweight; is easily cut to any shape; is so soft and flexible it can be readily installed around corners and curves without loss of effectiveness.

MICROLITE Goes Inside Ducts Too. Microlite duct liner is a most efficient, most practical acoustical duct insulation. You simply cut the desired size, adhere it to the metal and form the complete duct section in the brake.

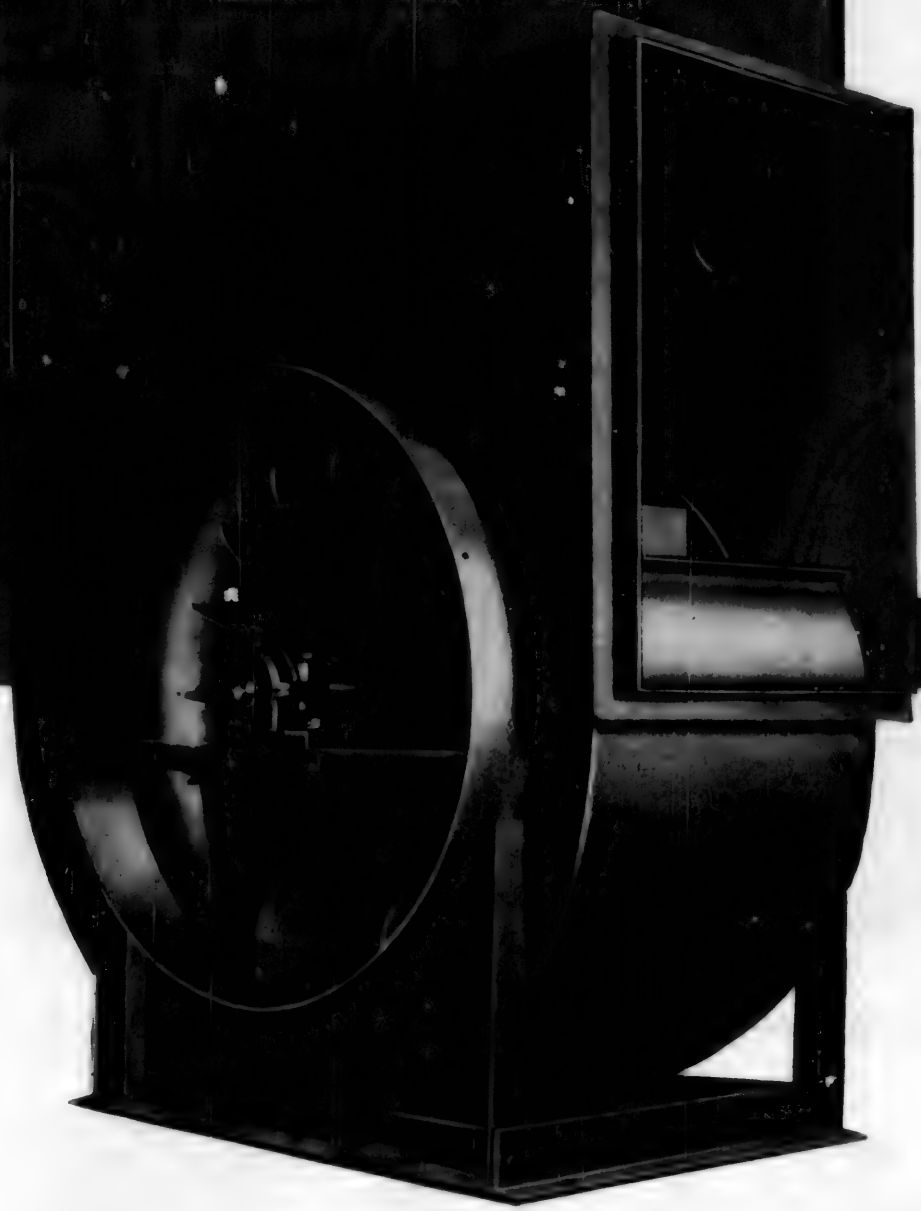
For samples and a folder, write to Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, O.

VITRON Glass Textile Yarns • Rovings • Micro-Fibers
DURAMAT Vapor Barriers • **BLUE FLAG** Pipe Wrap
MICROLITE Thermal and Acoustical Insulation
COUSTIC-AIRE and **THERMO-JET** Aircraft Insulations

GLASS FIBERS INC.

Makers of glass fibers by the ELECTRONIC-EXTRUSION process . . . developed, patented and used exclusively by Glass Fibers Inc.

BIG



"Buffalo"

TYPE "BL" VENTILATING FAN

- A new standard in quiet, efficient performance!
- Exclusive "Q" Factor* features that make it your safest fan to specify!
- 1,000 cfm to 500,000 cfm capacities!
- Full details in Bulletin F-100! Write for your copy!

** The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

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480 BROADWAY BUFFALO, N. Y.

Publishers of "Fan Engineering" Handbook

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

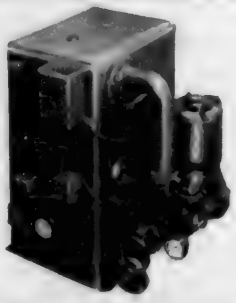
VENTILATING PRESSURE BLOWING AIR CLEANING COOLING AIR TEMPERING HEATING INDUCED DRAFT FORCED DRAFT EXHAUSTING

Announcing . . . new Dunham Thermo

New Thermo Vector painted to simulate wood paneling in office of Mathias Klein, President, Mathias Klein & Sons, Chicago, Ill.

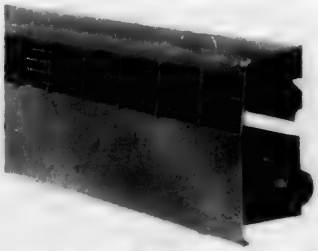
From radiator traps
to fully engineered systems
you can DEPEND ON DUNHAM for
everything you need in heating

Dunham Radiator Valves. Complete line of radiator valves, traps and other specialties for steam heating.

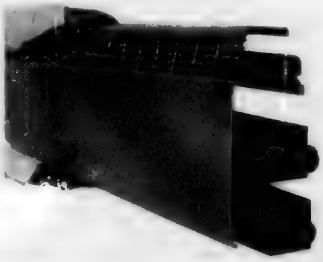


Dunham Vacuum Heating Pumps. Single and Duplex models. No close clearance parts. Only one moving element.

Vector along-the-wall radiation



Here you see the tailored, trim lines of new Thermo Vector.



Here you see how easily new Thermo Vector is installed using "hanging strip."

Here you see the lever-operated damper installed in three tier Thermo Vector.

—with a tailored, trim look

New Dunham Thermo Vector looks good ANYWHERE! Its smooth, unbroken horizontal lines blend beautifully in any office or commercial building . . . and Thermo Vector is sturdy enough to stand up for years and still look good in any industrial or institutional installation.

—with "built-in" versatility

New Dunham Thermo Vector is used flush mounted along the walls . . . one, two or three tiers high . . . with steam or hot water . . . steel or nonferrous elements. Use with full back or just use "hanging strip." Front outlet grille eliminates wall smudging—lets you install Thermo Vector ANYWHERE.

—with cost-cutting ease of installation

To install Dunham Thermo Vector, all you do is position the back or "hanging strip" on wall. Attach element support to it and hang elements. Mount one-piece cabinet . . . then accessories which conceal elements and piping for the "finishing touches." Fronts, backs and lever-operated damper easily cut on the job.

For further information, write for Bulletin ACHV-1, C. A. Dunham Company, 400 W. Madison St., Chicago 6, Ill.

DUNHAM

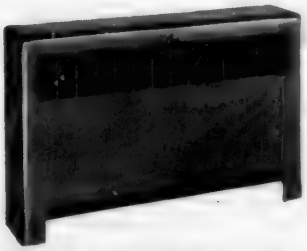
THERMO VECTOR RADIATION

TRADE-MARK

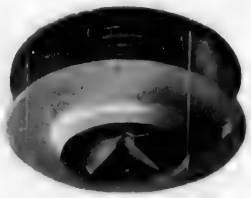
RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES

Quality First for Fifty-One Years

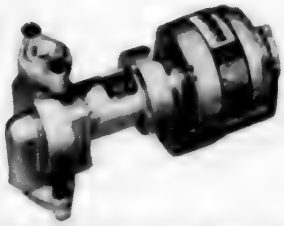
C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON



Dunham Radiation. Full range of sizes and types of convectors, baseboard and finned tube radiation.

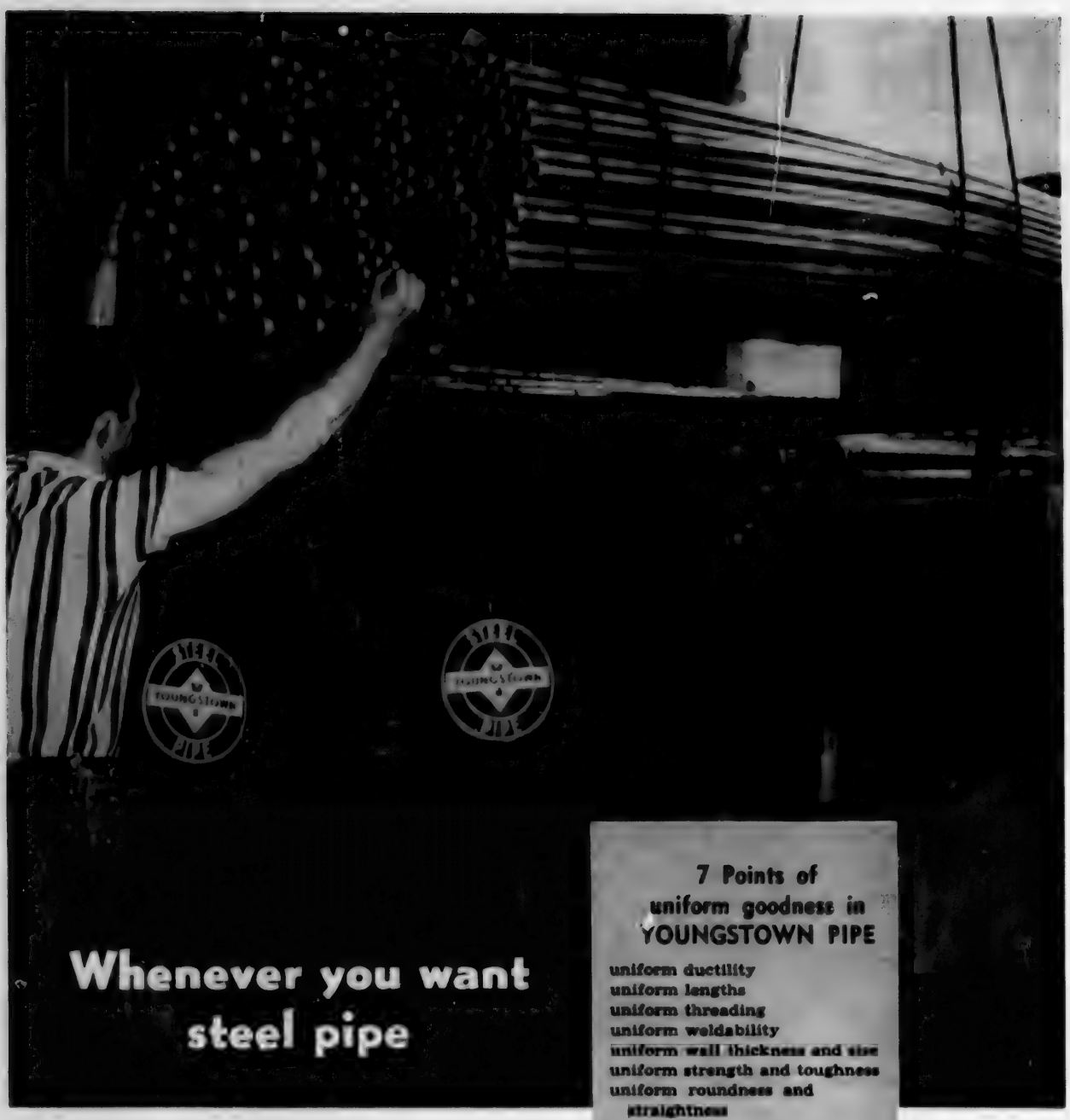


Dunham Unit Heaters. Line includes heating-cooling units, vertical, horizontal discharge and large blower unit heaters.



Dunham Circulators. Heart of Dunham's complete hot water line. Single-spring motor coupling. Brand-name motor.

Dunham Vari-Vac®. Precision temperature control system uses continuous-flow "cool" steam, cuts fuel costs up to 40%.



● Made of finest quality steel, with close attention to size, threading and finish — that's Youngstown! You can't buy better pipe anywhere.

And your Youngstown Distributor is there to serve you. He has a big stock of this good pipe in all wanted sizes, close at hand and ready to deliver promptly. Why not phone him whenever you need pipe?

Youngstown

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY — Manufacturers of Carbon, Alloy and Yoloy Steels

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From New York to Buffalo ...it's Sarcotherm at every point

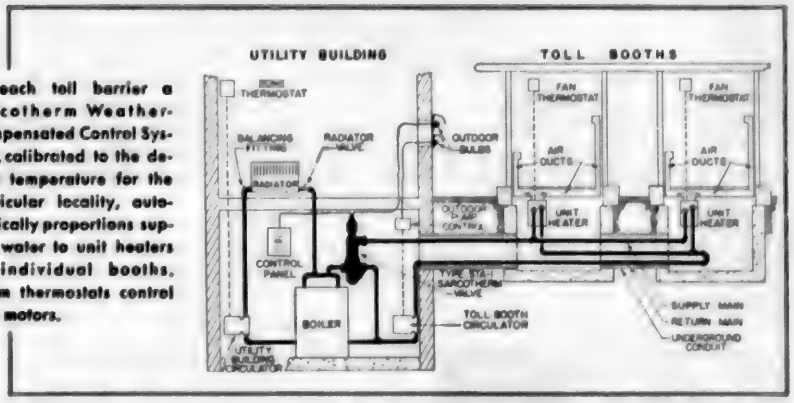
At all 40 toll interchanges heating systems controlled by Sarcotherm Weather-Compensated Systems

Mechanical Engineers: Syska & Hennessy, Inc., N.Y.C.
• Heating Contractor: Mechanical Installations, Inc., L. I. City • Booths by Tatler & Cooper, Brooklyn

HERE IN EFFECT is a heating system which stretches from the southeastern to the northwestern extremities of New York State.

It is obvious, therefore, that such a system must be so simple, so fool-proof, so utterly dependable, that any possibility of breakdown or other trouble will be reduced to an absolute minimum.

That is why *reliability* received so much attention from the Thruway's heating engineers. And that is one of the principal reasons why Sarcotherm Weather-Compensated Control Systems are installed in all 40 toll interchanges.



At each toll barrier a Sarcotherm Weather-Compensated Control System, calibrated to the design temperature for the particular locality, automatically proportions supply water to unit heaters in individual booths. Room thermostats control fan motors.

Advantages of Sarcotherm Systems

Easy to install — tailor-made drawings and diagrams of the complete system are furnished for each job.

Easy to maintain — by regular maintenance men, because of simplicity; fewer parts, such as transformers, relays.

Easy to adjust — to any desired setting.

Complete control system — including all specialties such as radiator valves, balancing fittings — all from one manufacturer, Sarcotherm. Unit responsibility.

On the job assistance — to contractors from Sarcotherm's field engineers.

SARCOTHERM CONTROLS, Inc.
Empire State Bldg., New York 1, N. Y.
An affiliate of Sarco Company, Inc.

4002-C

Weather-Compensated Control Systems for **HOT WATER, RADIANT AND STEAM** *Heating*

St. Ann's Church
Cleveland Heights, Ohio

The Vivian Webb Chapel, Claremont, Cal.

St. John's Church, Delphos, Ohio

Installation, Church of St. Philip, The Apostle, Clifton, N.J.

Strassbourg Cathedral, 15th Century

BETTMANN ARCHIVE

COMFORT GOES TO CHURCH

Throughout the ages the nobility of man has found no higher expression than in the beauty of the world's churches, temples and cathedrals.

But the majesty of a fifteenth century cathedral, with its lofty spires and delicate filigrees of stone, is no more wondrous than its modern counterpart of perhaps lesser artistry but far greater *comfort* that encourages attendance at worship.

Yes, *comfort* goes to church, now . . . and so do millions more people.

One of the greatest advances in achieving church comfort has been the widespread adoption of radiant heating. For no heating is quite as effective as the gentle, all-permeating, sun-like warmth . . . without drafts, currents, or dead spots . . . achieved by modern radiant heating. Today's church designers know that radiant heating, which assures *utmost* comfort and health protection for both the very young and the elderly groups within congregations, is also ideally suited for every other age of worshippers.

They know, too, that *steel pipe* is the most accepted medium for radiant heating systems . . . in fact, the most widely used pipe in the world for heating, plumbing, snow melting, fire sprinkler systems, and power, steam and air transmission.

Send for your free copy of the 48 page color booklet "Radiant Panel Heating with Steel Pipe" and let comfort go to your church, too.

Steel Pipe is First Choice

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 FIFTH AVENUE, NEW YORK 1, N. Y.

1930

Ingersoll-Rand MOTORPUMPS have been leaders in air conditioning for 24 years

1944

and NOW a new addition to the line!

9-46

Here's the pumping unit every air conditioning contractor or dealer has been looking for—the new addition to the Ingersoll-Rand Motorpump line.

A leader in 1930 with the first Motorpump for air conditioning, the line was re-engineered to produce the model of 1944. Now here are the fruits of more years of research and development . . . the new air conditioning Motorpump of 1955 by Ingersoll-Rand.

Investigate the features of this pump NOW, features that will insure you of the best pump and keep your reputation for installing efficient, trouble-free equipment.

1—Top hydraulic performance—more liquid moved with less power input.
2—Smaller and lighter in weight.
3—Mechanical seals—rotating ceramic against stationary "Teeplelite" seal face.
4—Positive impeller attachment (key and cap screw)—no screwed-on impellers.
5—A sure-fire and easy method of rotating pump by hand on spring start-up after winter shut-down to loosen seal and ring fits.
6—Priced to meet competition.

Get in touch with your nearest Ingersoll-Rand branch office now and start the 1955 air conditioning season off with the best.

CAMERON PUMP DIVISION OF **Ingersoll-Rand**

11 Broadway, New York 4, N. Y.

The most convincing stamp of user satisfaction

9 repeat orders for Sarco Heating Specialties

ANOTHER REPEAT ORDER FOR SARCO

Engine factory of Caterpillar Tractor Co., Peoria, Ill. *Architects & Engineers:* Giffels & Vallet Inc., L. Rossetti Assoc., Detroit. *Heating Contractor:* The Stanley-Carter Co., Detroit.
Sarco heating specialties also are providing trouble-free service in Caterpillar's Joliet and Decatur, Ill. and York, Pa. plants.

...won by past performance at Caterpillar Tractor Co.!

SARCO heating specialties were first installed in a Caterpillar plant back in 1947.

Since that first order, Sarco heating specialties have been ordered an *additional nine times* for four Caterpillar plants—each repeat order is indicative of the confidence Caterpillar has in Sarco performance.

Today, more than 1800 Sarco steam traps in addition to other heating specialties give trouble-free service at four Caterpillar Tractor Co. plants.

Architects, engineers and heating contractors appreciate this kind of dependability. It assures them complete user satisfaction, protects reputations, eliminates trouble-some call-backs. Why not specify Sarco on *your* next job?

For full information on all Sarco products, write Sarco Co., Inc., Empire State Bldg., New York 1.

America's Industrial Leaders Repeatedly Order Sarco Heating Specialties

Aluminum Co. of America
Bethlehem Steel Co.
Caterpillar Tractor Co.
Ford Motor Company
Lederle Laboratories (Div. of American Cyanamid Co.)
United Aircraft Corporation
U. S. Steel Company
Western Electric Company

2102-B

SARCO *saves steam*

STEAM TRAPS • TEMPERATURE CONTROLLERS • HEATING SPECIALTIES

Radistor Valves • Traps | Strainers | Float-Thermostatic Traps | Camlift Bucket Steam Traps | Thermostatic Traps | Water Blenders | Air Eliminators | Dial Thermometers | Self-Operated Temp. Reg.

Taylor Forge all the way

Throughout the power and process industries you will see hundreds of model installations like this where someone who wanted to be sure has specified Taylor Forge all the way through...WeldELLS,® flanges, welding necks, nozzles.

Whatever your needs—simple or complex—it will pay you to *use* all the way through, the products that have *led* all the way through.

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works: P.O. Box 485, Chicago 90, Illinois • Offices in all principal cities Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada

A New Development that's 37 Years Old

When you cut a hole in the shell of a pressure vessel you of course weaken it. But, how much?...or, to put it another way, how much reinforcement is necessary to make the shell surrounding an opening as strong as any other part of the shell?

In the old days of low pressure and over-sizing that hadn't been much of a problem. But when pressures began to climb fast (about 1915) it became a tough one.

Taylor Forge had already begun to relish problems like this: had pioneered the forged steel flange; was playing a major part in the development of flange and piping standards. So it isn't at all surprising that Taylor Forge again came forward with the solution — the first seamless forged steel pressure vessel nozzles.

The research and testing that Taylor Forge put into designed pressure vessel outlets dates back to the riveted, sweep nozzles that are still giving safe, satisfactory service. But as riveting gave ground to welding, still more critical analyses were made to determine the exact requirements of nozzles designed for welding.

These many years of tests and studies were fully summed up in a paper entitled "Effects of Openings in Pressure Vessels" which was presented by the late J. Hall Taylor and Professor E. O. Waters at the June 1933 meeting of the ASME. It is still authoritative in this field.

Yes, a new idea that is 37 years old! So thoroughgoing was its first development—so critical the steps taken to maintain its leadership—that today Taylor Forge Seamless Nozzles and Welding Necks are the standards of the entire pressure vessel and piping industry.

An episode in the story of Taylor Forge leadership in designed piping

THE MEASURE OF A GOOD AIR FILTER

YOU ARE INVITED!
ASHVE—BOOTH 10

1", 2" or 4" thick?

Whether you need filters for package air conditioners or furnaces, for general filtration or for special applications requiring the highest efficiency and greatest dirt capacity, Farr Company has a standard type to fit the job—available in steel, aluminum, copper, stainless and monel.

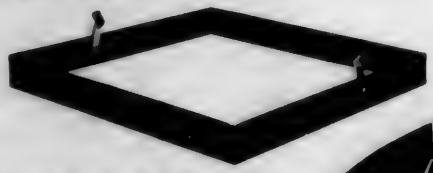
How much media?

In FAR-AIR* filters you get more media per square inch *plus* the famous herringbone-crimp design that assures greater dirt holding capacity and lower pressure loss. Firmly packed media provides even density and assures uniform high efficiency over the entire filter area.

FARR COMPANY
NO COMPROMISE IN QUALITY
Los Angeles, New York, Chicago, Memphis

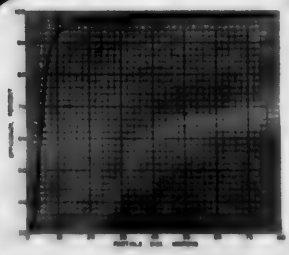
*Trade Mark

What kind of construction?



Heavy gauge filter frames and interlocking holding frames assure rigid filter banks and proper fit. Reinforcing rods drilled through the filter media make the filter more rugged. *Engineered* quality assures longer service life.

How efficient?



High efficiency in a filter is its only real reason for existence. FAR-AIR* filters consistently deliver superior performance. Send for your set of efficiency curves which show how the various types of FAR-AIR* filters will perform for you.

FARR COMPANY
P. O. Box 45187, Airport Station
Los Angeles 45, California

☐ Send efficiency curves
☐ Send a Farr Field Engineer

Name_____ Title_____

Company_____

Address_____

Barkow

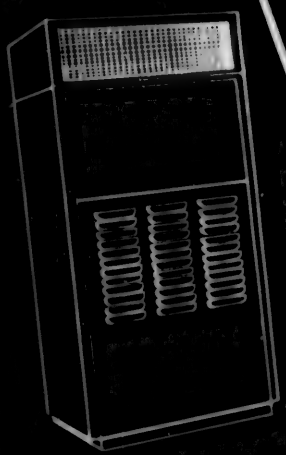
AIR-COOLED and WATER-COOLED *Weatherwise* Air Conditioners

Now Barkow brings you new unlimited opportunity with both **Air-Cooled** and **Water-Cooled** units for residential and commercial air conditioning! Sizes range from two to five ton capacity ... are available as self-contained units or without plenum and blower. Features include one and three phase hermetic compressors, counter-flow cleanable type condensers, aluminum fin evaporators with copper tube and capillary feed, specially designed expandable manifold, and new type switch control panels suitable for use with standard thermostats.

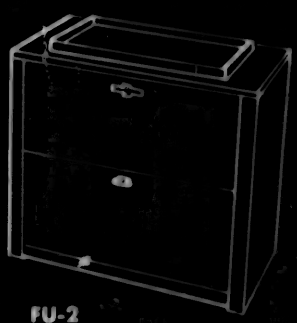
Aug. G. BARKOW Mfg. Co., Inc.
2230 So. 43rd St., Milwaukee 15, Wis.

YOU ARE *Invited*

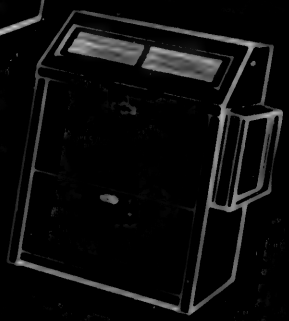
to investigate the advantages of a Barkow franchise and to inspect the units in IHVACE Booth #C-37



CU-5
Water Cooled

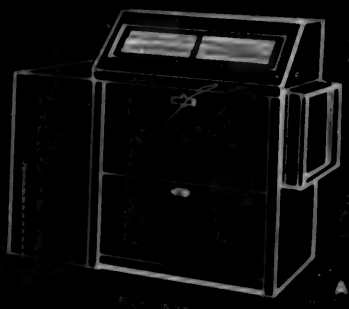


FU-2
Water Cooled



CU-3
Water Cooled

FU-3
Air Cooled



CU-3
Air Cooled

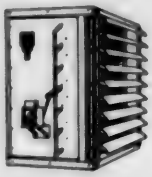
Is this the way your plant gets its MAKE-UP AIR ?

IF SO, YOU NEED

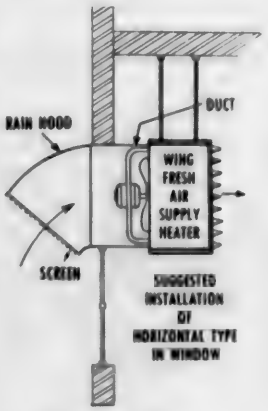
WING FRESH AIR SUPPLY HEATERS

WHEN air is exhausted from paint spray booths or other plant operations, it must be replaced. If no other means are employed, it rushes back through opened doors or windows, or seeps back through cracks and crevices. Your exhaust fans can't work properly or efficiently and your heating system is nullified. WING FRESH AIR SUPPLY HEATERS are the answer. They supply make-up air properly heated, they require no expensive duct work and the coils cannot freeze, regardless of weather, because full steam pressure is on at all times.

Write for complete information



HORIZONTAL TYPE WING FRESH AIR SUPPLY HEATER



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Patented media design and unique "soak-then-flush" action provide thorough self-cleaning. Ferris-wheel feature eliminates reversing media to direction of air flow in back curtain—no dust can be blown back into clean air stream.
CA-24 DYCON
Oil-free, synthetic fiber media of this deep-bed (8") unit filter effectively traps and holds dust by accumulated static charge. Large dust-holding capacity. Choice of various media blankets to provide degree of efficiency desired. Easily rinsed for re-use—cuts maintenance costs.
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Continental's patented media assures high efficiency, easy washing, freedom from clogging, and exceptional dust-holding capacity.
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E-Z-OIL AEROSOL BOMB
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E-Z Oil

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NO. 7 AND NO. 77 AUTO-VENTS

Self-closing, float-controlled valve — Non-ferrous metals — No air chamber required — Designed for working pressures up to 75 lbs.

No. 7 AUTO-VENT Size 4⅜" x 2¼" with ⅛" I.P. female connection.

No. 77 AUTO-VENT Size 4⅜" x 2¼" with ⅛" I.P. female connection.

The No. 77 is of the same design as the No. 7, except, that it has a ⅛" I.P. side opening to permit its use on overhead pipe lines, coils, etc., where headroom is a factor. The connections are made as illustrated.

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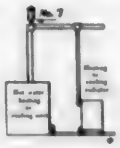
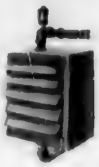


- FOR VENTING UNIT HEATER



- FOR VENTING TRAPPED MAINS AND CIRCULATING LINES

- FOR VENTING CONVECTORS

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No. 777 VALVE CORE Removable self-closing unit

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No. 7A CONNECTOR FOR SAFE WASTE

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Dependable float-operated valve—Non-ferrous metals—No air chamber required—For working pressures up to 50 lbs.

No. 27 AUTO-VENT Size 3" x 2½" with ⅛" I.P. female side connection.

FOR HORIZONTAL MOUNTING ONLY

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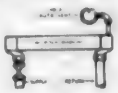

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No. 7A CONNECTOR FOR SAFE WASTE

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No. 67 AUTO-VENT Size 3-3/16" x 1½", with ⅛" I.P. male connection.

FOR VERTICAL MOUNTING ONLY

- FOR VENTING CONVECTORS

- FOR VENTING BASEBOARD RADIATION

ACCESSORIES AND REPAIR PARTS

No. 777 VALVE CORE Removable self-closing unit

No. 7A CONNECTOR FOR SAFE WASTE

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Expansion and contraction confined to 4 vent slots only—Single composition control disc—internal siphon tube—No air chamber required—Can be set for manual or automatic venting.

No. 72 AUTO-VENT Size 1¼" x ½" with ⅛" I.P. male connection.

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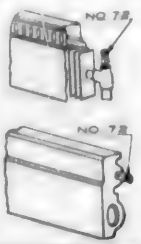
- FOR FREE STANDING RADIATORS

- FOR VENTING STEEL, COPPER OR CAST IRON BASEBOARD RADIATION



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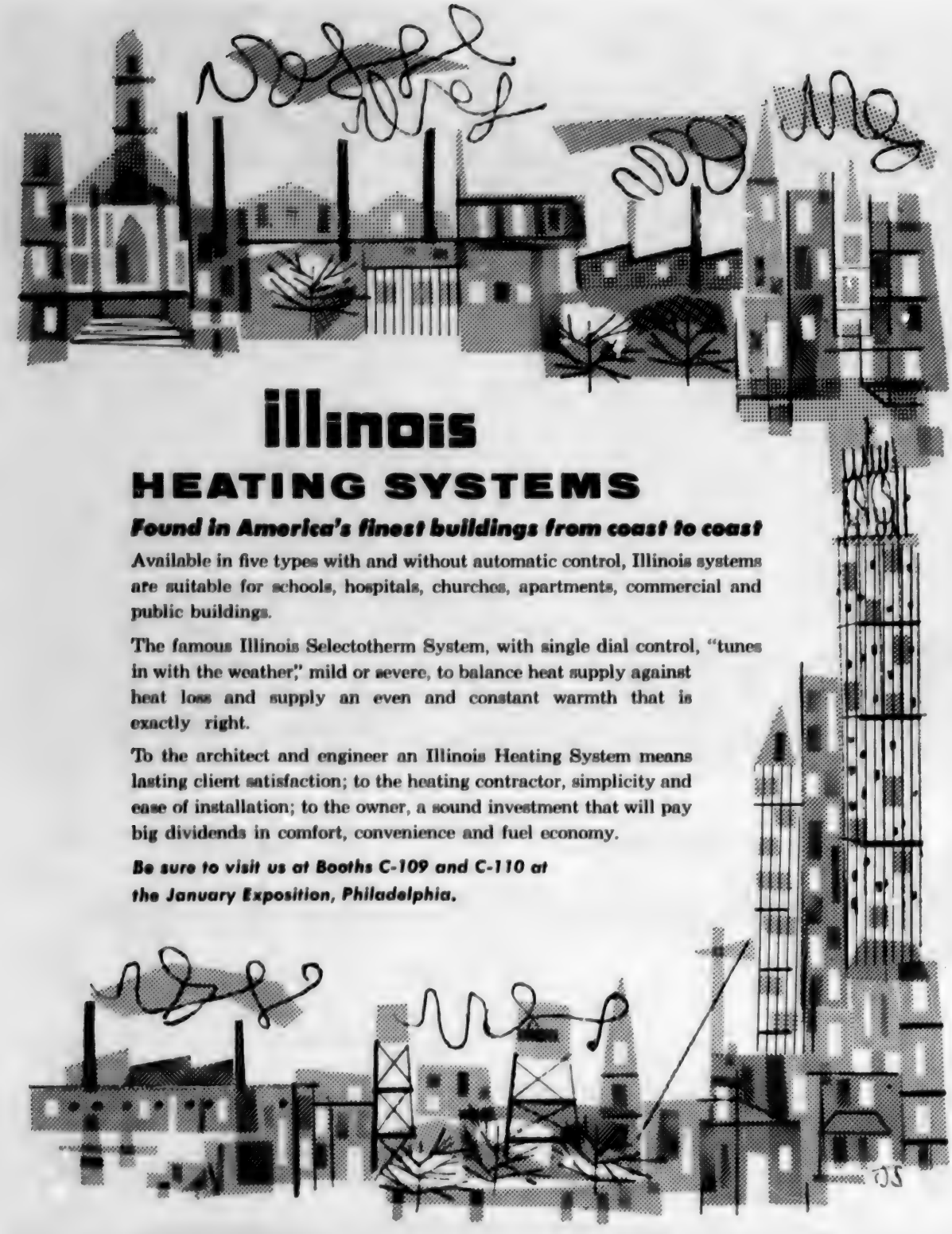

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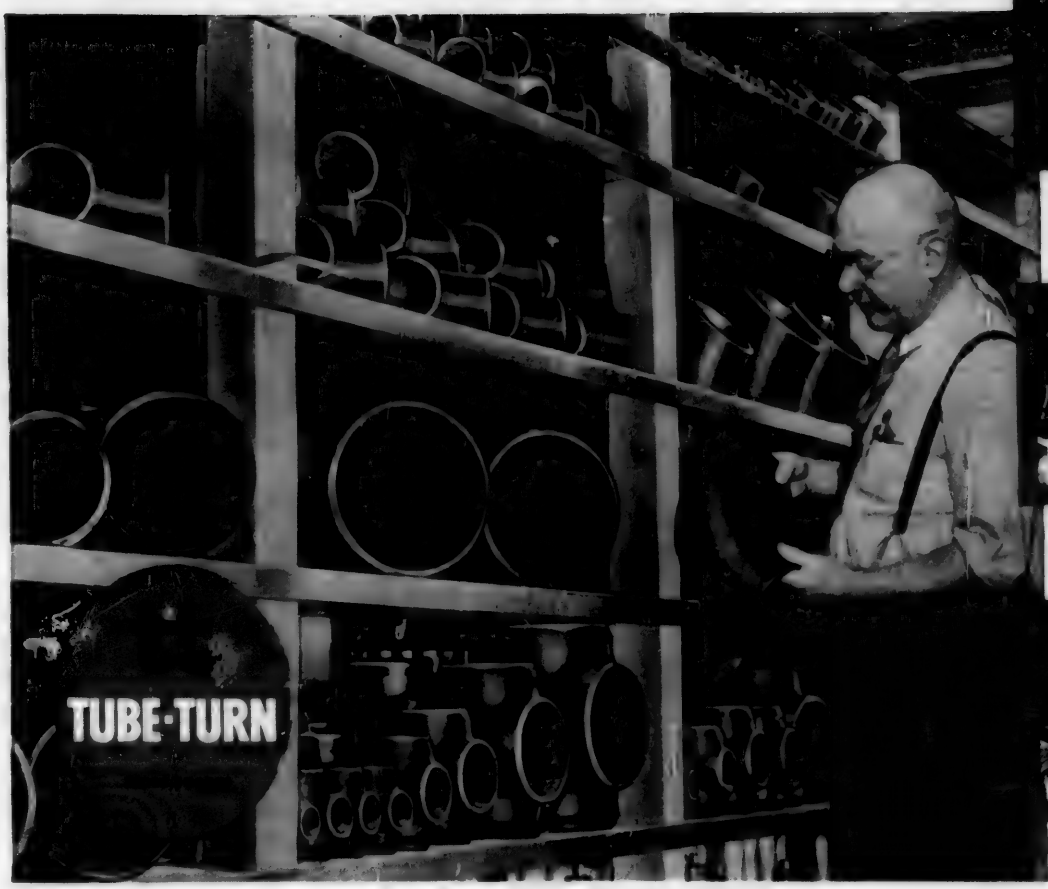

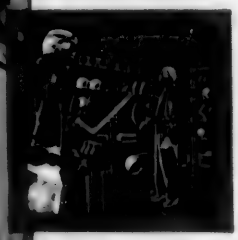

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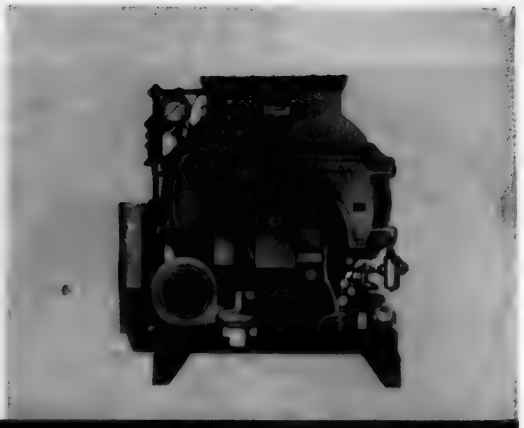

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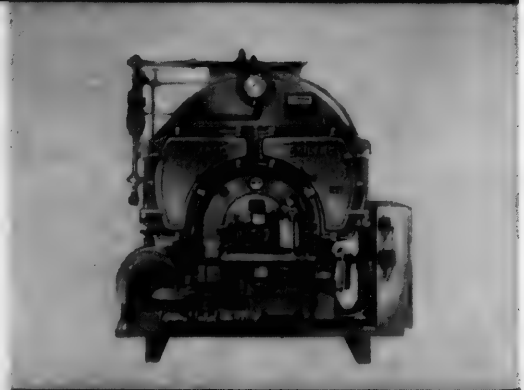

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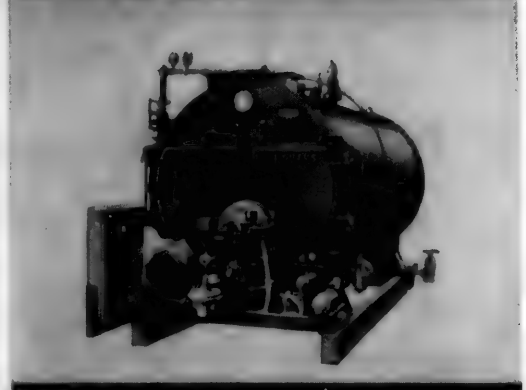

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You can be sure of lower operating cost and higher efficiency. Reserve Plus Rating certifies that 50% or more power is built in to provide for piping, pickup and additional capacity requirements. It means "cruising speed" operation with extra reserve power to take care of emergencies. It means ratings based on nominal capacity, not maximum capacity.

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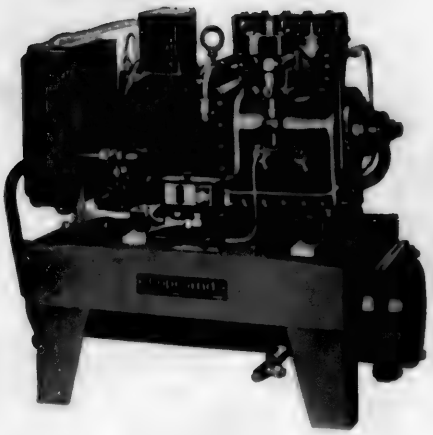

Cutaway of 7½ H.P. COPELAMETIC Motor-compressor

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Whether it's a room air conditioner, a large package unit or a huge factory system, COPELAMETIC is your answer to the question "Which refrigeration unit shall I recommend for the air conditioning system?" COPELAMETIC has become the standard of comparison for dependability, ruggedness, compactness and long life. Your clients will appreciate the COPELAMETIC design which eliminates belts, seals and manual oiling . . . reasons for 9 out of 10 service calls. Better yet, they'll appreciate the practical feature of accessibility.

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Principles, Data and Procedure to Help You Analyze and Solve Industrial Ventilation Problems

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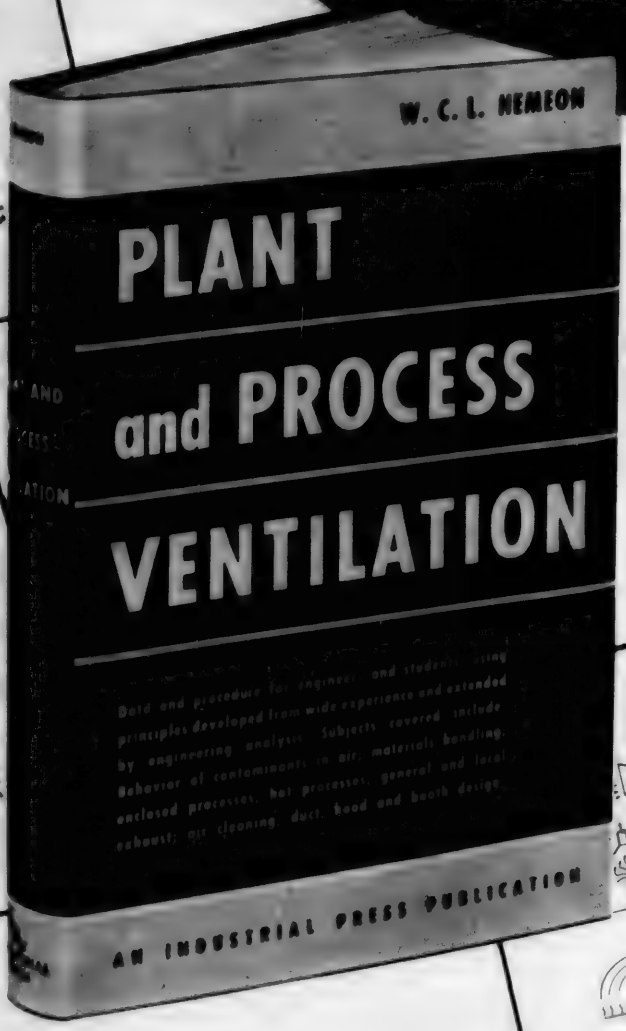

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Canopy Hoods—Exhaust for Hot Processes

Characteristics of Free Air Jets

General Ventilation

Design of Duct System

Exhaust Systems for Dust

Evaluation and Control of Heat Exposures

Field Observations and Assembly of Design Data

Methods of Moving Air

Exhaust Air Cleaning

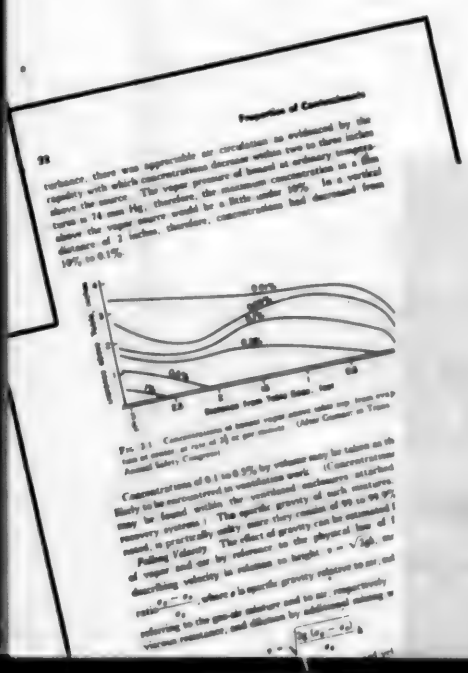
PROCESS VENTILATION

PLANT and PROCESS VENTILATION, by W. C. L. Hemeon, contains new, original conceptions of ventilation principles and practice that will enable you to analyze and solve all types of industrial ventilation problems. The author is Engineering Director of the Industrial Hygiene Foundation, and is thus eminently qualified to present this subject in a clear and comprehensive manner. His book differs from others on ventilation in that emphasis is placed on the estimating of ventilation quantities required in various industrial applications, while the subject of duct design, a well understood technique, has been simplified by condensation of design data.

PLANT and PROCESS VENTILATION provides you with design factors and data that can be applied to any situation. Principles are clearly set forth and lead logically to rules of procedure. Those principles which apply to exterior hoods and booths are extended to cover all ventilation and material transport situations. By the simple observation of a process, you can now estimate accurately the exhaust requirements of any cold, multi-directional process; and, with the necessary field data, refer to tables which summarize exhaust requirements for such a situation.

Presented for the first time is a theory for estimating air flow induced by motion of solid particles; for example, by falling motion, as in the handling of bulk materials. New principles derived by the author are found in the chapter on canopy hoods and exhaust for hot processes. The author presents a simplified method, easy to apply, for the design of air injectors, and a new development in connection with the design of natural draft ducts to carry away contaminated hot air and gases from canopy hoods and the like. Also treated is the problem of ventilating large mill buildings that house processes releasing massive quantities of heat. A complete analysis of the behavior of roof ventilators and air currents within a building is presented so that the plant engineer can analyze a particular problem and explain the frequently anomalous behavior of large-scale ventilation currents.

If you are an engineer, a contractor, or a student interested in industrial ventilation, here is a book that is a *must* for your technical library. PLANT and PROCESS VENTILATION will serve you well as a valuable, comprehensive, time-saving reference book on all your industrial ventilation problems.



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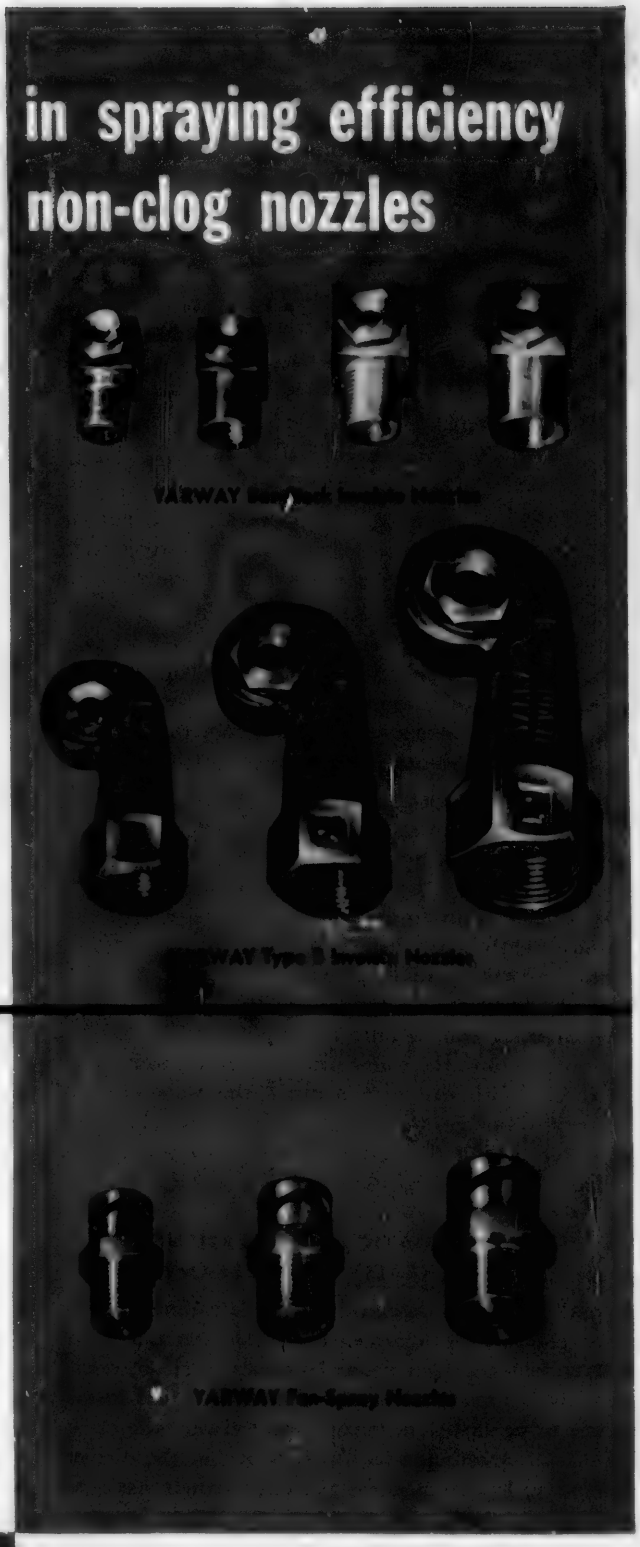
in spraying efficiency non-clog nozzles



cone spray

Most popular design for cooling, recooling, washing, rinsing, air conditioning, drying and other spraying operations in industrial and processing work and in power plants.

Non-clog involute design has no internal parts (vanes or deflecting plates) on which foreign particles can collect. Special contour of nozzle body guides flow with minimum loss of energy towards discharge opening, where liquid attains maximum velocity and leaves nozzle in a fine hollow-cone spray.

Available in three types:

Bar-stock bronze (shown) for fine spray
Sizes ¼" and ⅜", male or female connection
Capacities up to 3 gpm; pressures 20 to 50 psi

Cast bronze Type B (shown) for air conditioning and small recooling systems
Five sizes, ½" to 1½"
Capacities up to 40 gpm; pressures 7 to 25 psi

Cast bronze Type C (not shown) for spray pond service
Sizes 2" and 2½"
Capacities up to 110 gpm; pressures 7 to 15 psi

Write for YARWAY Spray Nozzle Book N-617; it gives capacities, dimensions and application information.

fan spray

Preferred for many washing and cooling operations. Non-clog design, delivers flat fan-shaped sheet of spray with slicing action particularly desirable for surface washing.

Thin sheet of spray is discharged forward 30° from the vertical, spreading in fan shape up to 140°, depending on operating pressure.

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YARWAY spray nozzles

Random Thoughts from a Filter Engineer

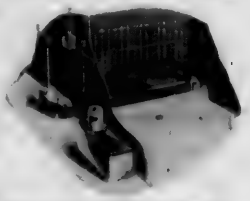
by Ned Lamprecht

- **NEW IDEA IN WASHING ELECTROSTATIC PRECIPITATORS**
- **DO AUTOMATIC SELF-CLEANING FILTERS REALLY STAY CLEAN?**
- **IS IT TRUE WHAT THEY SAY ABOUT "SELF-CHARGING ELECTROSTATIC" AIR FILTERS?**

NEW IDEA IN WASHING ELECTROSTATIC PRECIPITATORS

They say there's nothing new under the sun. But we think that occasionally someone does come up with a new wrinkle. To wit, our washers for electrostatic precipitators.

In designing them, two problems loomed up big. How to design a washer that would take up the least space. And how to concentrate the available water pressure to get the greatest efficiency. We think we've licked both problems in Air-Maze automatic and semi-automatic washers for the Electromaze.



Cutaway view of typical Electromaze assembly with semi-automatic service system.

First, the moving headers are located *underneath* the precipitator instead of in front of or behind it. Only a few inches in height are used and none in depth. And because the headers are smaller, extending only the depth of the unit, the water pressure exerts more washing force. With this arrangement, the water washes two ways—both going up and coming down. None of the water or adhesive spray is wasted by going into the front of or back of the duct.

DO AUTOMATIC SELF-CLEANING FILTERS REALLY STAY CLEAN?

We can't give a run-down on the whole automatic filter industry but we can report on Automaze, our automatic self-cleaning air filter. It does stay clean, *really* clean! We've made numerous checks of actual installations, to be sure. The results were always the same. After months of operation in the dirtiest locations, the individual panels were removed and they looked almost the same as they did the day they were made.

Automaze

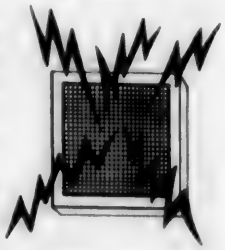
The secret, of course, is Air-Maze's exclusive "pulse-type" action. Each filter panel in the revolving curtain is submerged in the cleaning tank and vigorously agitated 6 or more times by a compressed air drive. In this way, each panel is thoroughly cleaned and recharged with adhesive. If you're interested, why not let us send you our catalog, telling the complete Automaze story?

IS IT TRUE WHAT THEY SAY ABOUT "SELF-CHARGING ELECTROSTATIC" AIR FILTERS?

We decided to find out, once and for all, just how well a "self-charging electrostatic" filter would perform. They had talked a good filtering job and the "self-charging" idea certainly sounded intriguing. But could their performance match their claims? We decided to find out. So we bought three different brands to see how they ticked.

First, we borrowed a voltmeter so sensitive that it registers when you scratch your hair 20 feet away, and we tried to get a reading from the filters. No success. We couldn't get the needle to move, even when passing air through the "filters".

But, since performance is proof of the pudding, we tested one of them with the National Bureau of Standards Discoloration Method, using outside air—the test normally used for electrostatic filters by the U. S. Government. We have a dual-duct test set-up and placed one of our Electromaze* electrostatic precipitators in one duct and the "self-charging" panel in the other so the test could be made simultaneously. The Electromaze filter was 93.8% efficient; the "self-charging" filter was only 10.7% efficient.



We want to be open-minded about "self-charging" filters but, on the evidence so far, we have to question whether they live up to their claims. The Air-Maze Corporation, 25000 Miles Avenue, Cleveland 28, Ohio.

*This unit uses 10,000 D.C. voltage.

AIR-MAZE
The Filter Engineers
AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

air conditioning ducts

. . . installed in a matter of minutes with

DRIVE-IT SYSTEM

SPLIT SECOND FASTENINGS TO CONCRETE OR STEEL

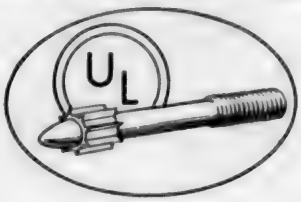
Air Conditioning on the new Hotel Algiers in Miami, Fla., was speeded by use of Drive-it Fastening Tools.

Fastening overhead installation even in cramped conduit tunnels easy for new Drive-it 320.

NEW EXCLUSIVE

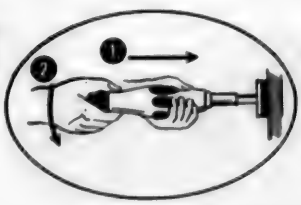
DRIVE-IT 320 WITH BREAK-OPEN ACTION

Snap open action results in the fastest operating tool on the market. Easiest method to load and eject cartridges under any condition.



Drive pins are Underwriters' Laboratories approved.

Controlled Power. First and only tool which requires but one standard power load regardless of penetration desired. No need to buy and stock various strength power loads.



Three-way Safety. Cannot be discharged accidentally, due to the push and turn firing sequence. This, plus the large, swivel safety pad, makes DRIVE-IT triple safe.

More fastenings per hour with this speedy way of loading and ejecting cartridges.

SEND THIS COUPON FOR FULL DETAILS

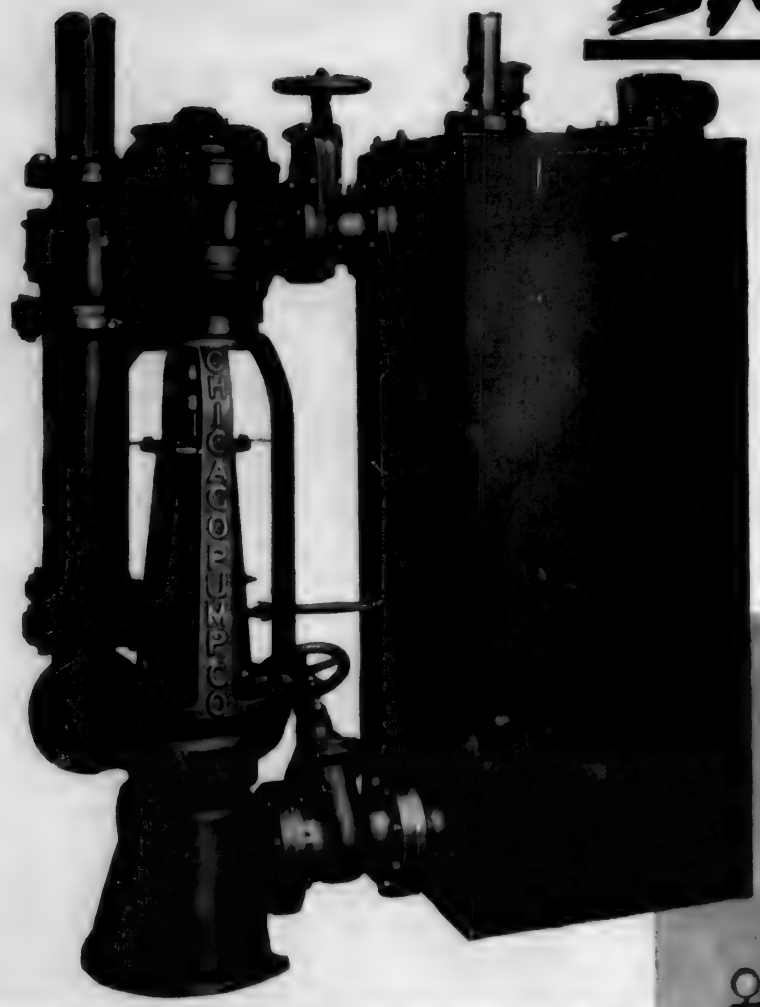
POWDER POWER TOOL CORP.
Dept. 2, 7526 S.W. Macadam Ave., Portland 1, Ore.
Canada: Ammo Power Tool Co., Ltd.
735 Broadway, Vancouver, B. C.

☐ Please send FREE catalogue and literature.
☐ I want a FREE demonstration of *DRIVE-IT*.

Name_____
Street_____
City_____ State_____

DRIVE-IT
the original **POWDER-ACTUATED TOOL**

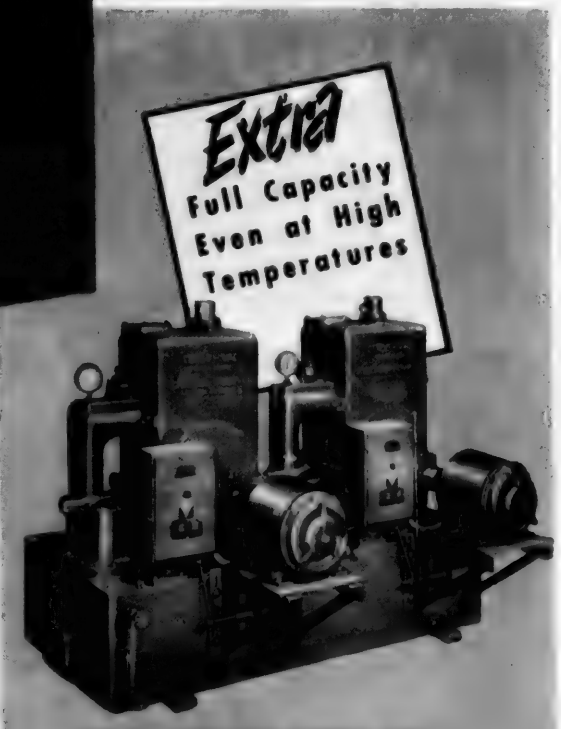
these "Extras"



Extra Positive Clog-Proof Sewage Handling

FLUSH-KLEEN Sewage Ejector-TYPE "S"

The Flush-Kleen Sewage Ejector can't clog because only liquid is handled by the impeller. Coarse matter is strained out, then backwashed from the strainer into discharge pipes. No strainer baskets to clean, no repairs due to clogging, no foul basins because solids never reach the wet basin. Besides being easier to maintain, Flush-Kleens last longer and require less power. Write for details in Bulletin 122C.



DUPLEX CONDO-VAC RETURN LINE VACUUM AND BOILER FEED PUMP

low inlet—no close clearances—no expensive maintenance — no vacuum on stuffing box results in full air handling capacity applied to system—for vacuum heating systems, pressures to 40 psi., capacities 2,500 to 150,000. See Bulletin 270.

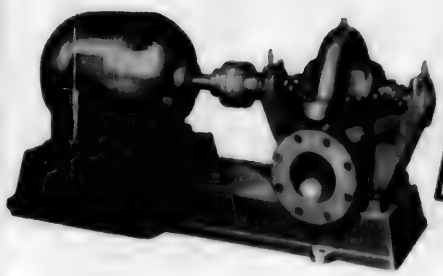
LET'S TALK PUMPS FACE-TO-FACE
At Booths 201 and 205, ASHVE Convention
Philadelphia,
Jan. 24-28

in CHICAGO PUMPS

— mean longer, better performance — lower cost operation and installation

For over 45 years Chicago Pump Company has specialized in manufacturing pumps specifically for service in plumbing, heating and air conditioning systems.

Architects, engineers and contractors assure building owners of reliable, long life service by using Chicago Pumps.



Extra Proved Service Record

DOUBLE SUCTION HORIZONTALLY SPLIT CASE PUMP

accurately machined and fitted revolving parts in carefully cast casing. Have proved reliable for house pump, circulating and booster service. See Bulletin 101.

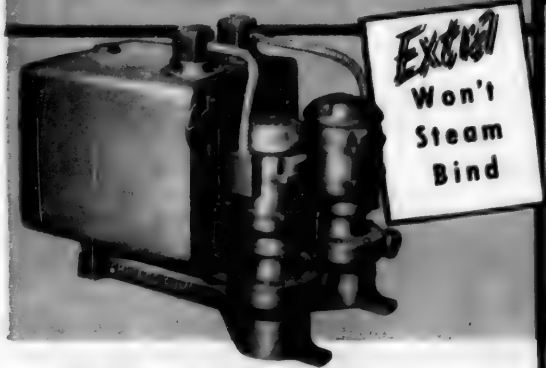
A COMPLETE LINE FOR EVERY BUILDING SERVICE

The Chicago line includes centrifugal pumps for hot and chilled water circulating, condensation and vacuum heating, air conditioning, pneumatic water systems, booster systems, cooling towers, drainage and sewage disposal. For details, write for Bulletin 25.

Extra Low Installation Cost

TYPE AVC CONDENSATION PUMP AND RECEIVER

low inlet—no elaborate foundation needed for installation—for systems to 10,000 EDR and 10-30 psi. See Bulletin 245.



Extra Won't Steam Bind

SURE-RETURN CONDENSATION PUMP AND RECEIVER

low inlet—positive head on suction—no friction in manifold between pump and receiver—handles extremely hot condensate without steam binding—for systems to 75,000 EDR and low or medium pressures. See Bulletin 250.

Extra Leak-proof Seal

NEW F-C AND C-C PUMPS EITHER FLEXIBLE-COUPLED OR CLOSE-COUPLED

compact, smooth running, quiet—ceramic faced seal is highly resistant to wear—for circulating and booster service. Heads from 10 to 190 feet, capacities from 5 to 400 gpm. Bulletins 107 and 108.

Write to Department B

CHICAGO PUMP COMPANY

Subsidiary of Food Machinery and Chemical Corporation

BUILDING PUMP DEPARTMENT

1132 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac, Sure Return, AVC, LVC, Fire, House & Circulating Pumps

Flush-Kleen Sewage Ejectors Little Giant & Non-Clog Sump Pumps

The Carnegie Endowment International Center

United Nations Plaza, New York. **Architects:** Harrison & Abramovitz; **Mechanical Engineers:** Syska & Hennessy; **General Contractors:** Caldwell-Wingate Co.; **Heating & Air Conditioning Contractors:** J. L. Murphy, Inc.

How to air condition an 11-story building *that's only 10 stories tall*

THERE is a trend toward lower ceiling heights, to reduce building costs and make rooms look "friendlier." Following this movement, the Carnegie Endowment International Center has low 9-foot ceilings. As a result the 11-story building was fitted in a normal 10-story building shell.

Low ceilings, however, create air conditioning problems. They cannot be furred down to hide the ductwork necessary for most air conditioning systems. *But, the American-Standard Remotaire system does not require bulky ducts.* One pipe carries chilled or hot water from a centrally located plant to each individually controlled Remotaire unit in the building.

Remotaire units condition the air through 4-row coils, and circulate it through the room. They filter and blend room air and fresh air.

Remotaire units come in 200, 400 and 600 cfm capacities. They can be recessed in the wall, either completely or partially, or left free-standing. Handsome steel jackets can be painted if desired.

Installation and maintenance of Remotaire units is easy. Plenty of wrench space is provided to make pipe connections. Motor and fan assemblies can be removed as a unit. Coils can be reversed for left or right-hand connection.

For more information about Remotaire send for descriptive literature . . . Form 417, **American Radiator & Standard Sanitary Corp.**, Dept. HV-15, Pittsburgh 30, Pa.

AMERICAN-Standard
WATER HEATING-COOLING SYSTEMS

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

EBKO

PIPING SYSTEMS

Why EBKO Prefabricated Insulated Piping Systems should be selected for underground and overhead distribution of steam, condensate return, hot and chilled water.

EBKO is designed and constructed of quality materials having proven their stability and reliability for many, many years. The trial and error stage is long past.

Because EBKO has positively proven itself with years of actual physical experience, theoretical ideas play no part in its construction. EBKO Piping Systems are guaranteed for these reasons — Time Tested and Test Proven — the magic phrase to a successful installation with the highest performance characteristics obtainable.

EBKO assures satisfaction and security. EBKO has established a reference of successful installations throughout the country only by supplying the industry with a quality product with such features as permanency, maintenance free operation, and high efficiencies.

The insulated prefabricated piping system is only one of the many popular systems manufactured by EBKO.

E. B. KAISER CO.

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2114 West Lake Avenue • Glenview, Illinois

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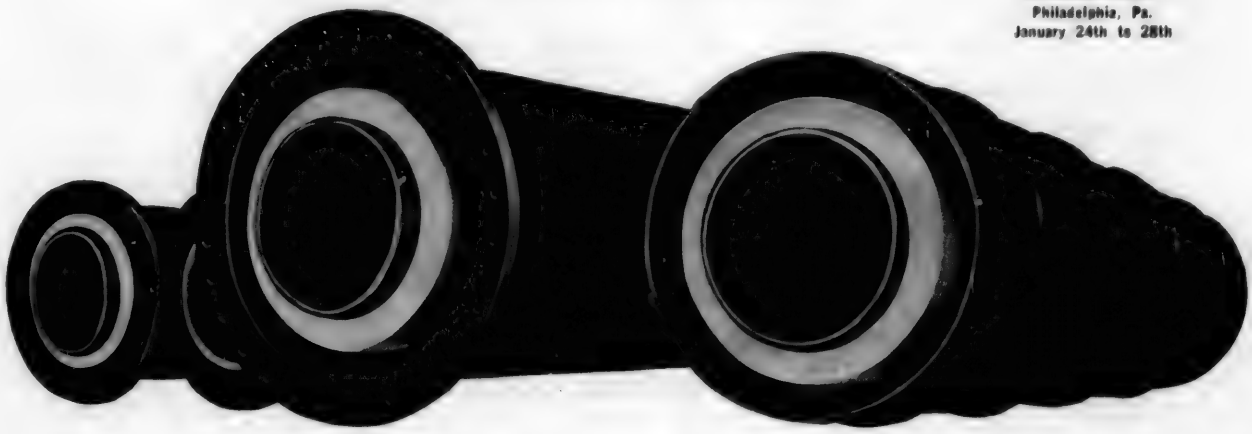
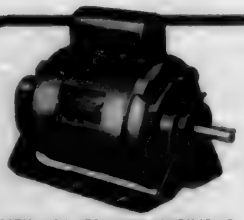
You are invited to our Booth 247 12th International Heating & Ventilating Exposition Commercial Museum Philadelphia, Pa. January 24th to 28th

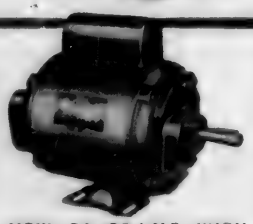


Here's why the Wagner Type RK Capacitor-Start Motor is the Right Kind of motor for your singlephase applications



NEW 56 FRAME RESILIENT MOUNTING—This Wagner Type RK is shown in the new 56 frame that is used for ½, ⅓ and ¾ hp ratings. The resilient mounting offers unusual freedom from vibration and noise.

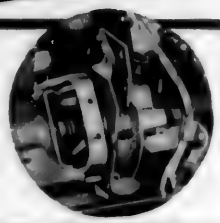
Smaller fractional ratings, and integral sizes from 1 through 5 hp, are also available.



NEW 56 FRAME WITH WELDED RIGID BASE—Wagner rigid base Type RK motor, in the new 56 frame size. The formed steel base is securely welded to the rolled steel frame to produce a strong, rigid assembly that will not get out of alignment.

Type RK is also available with machined end plates for flange mounting.

THICK ROLLED STEEL FRAMES—Frames for these motors are made of thick rolled steel, with machined heads on each end which accurately position the end plates. The frames have no openings, and are treated inside and out to prevent rusting.



LONG-LIFE CENTRIFUGAL SWITCH—These motors are equipped with the Wagner-made quick-break switch that disconnects the starting winding and capacitor from the line when the motor approaches operating speed. It will make over a million starts and stops without trouble—your assurance of years and years of unfailing performance.

A lot depends on the motor you specify to power your product. The selection of a Wagner Motor will assure:

Customer Acceptance that results from the recognition of a motor built by a manufacturer with a *proven* reputation for quality motors . . .

Customer Satisfaction that results from uniform trouble-free performance and long-life operation . . .

Customer Service possible only when the motor manufacturer has the ability and the organization to provide immediate repair parts and service, *when* and *where* they're needed.

The Wagner Type RK Capacitor-start induction motor meets these requirements and offers the additional advantages shown above. That's why the RK is first choice of many leading manufacturers of machines and equipment that require singlephase motors in fractional or integral ratings up through 5 hp.

Your nearby Wagner engineer can help you select the *right* motor for your application. Call the nearest of our 32 branch offices, or write us.

Wagner Electric Corporation EST. 1891

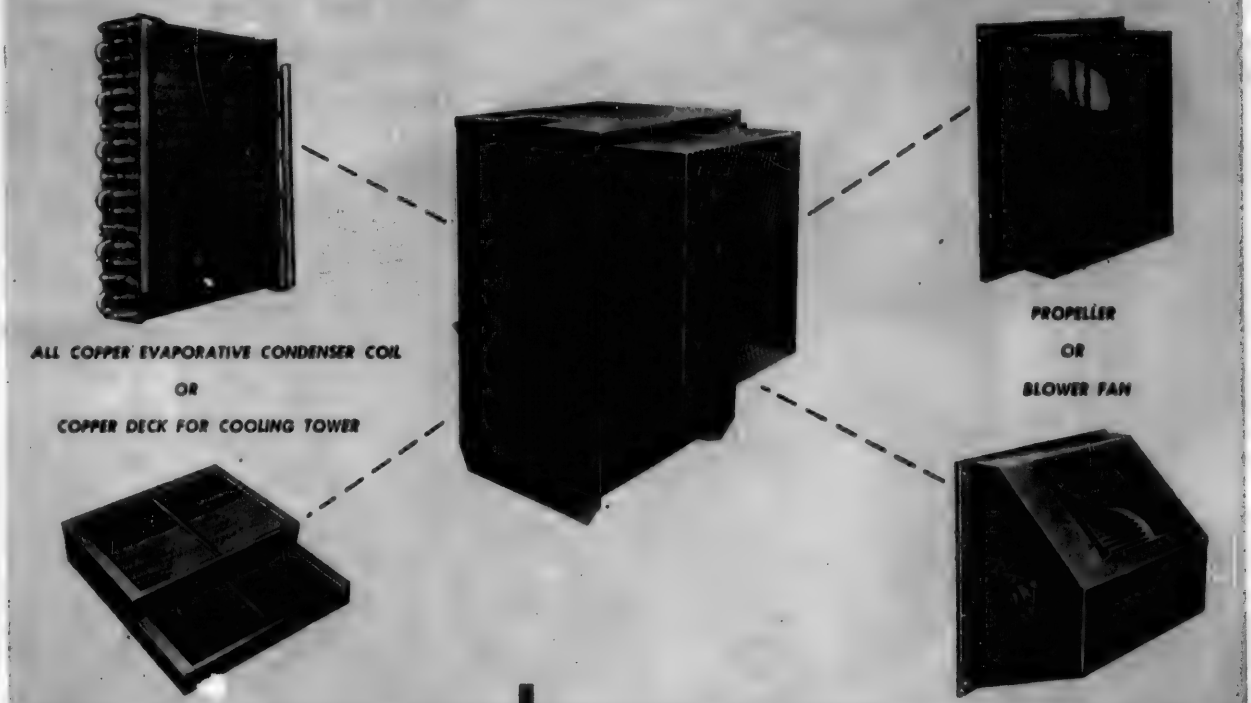
WAGNER ELECTRIC CORPORATION
6463 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

MBS-6

AMAZING NEW 4-WAY WATER SAVERS WITH ALL COPPER WATER SURFACES... by BUSH



YOU SELECT

Inner-Fin Evaporative Condenser Coil (All Copper) or Copper Deck Cooling Tower with Propeller Fan or Blower Fan.

You'll find FLEXIBILITY in these Bush Water Savers, never before available. And Bush FLEXIBILITY enables you to maintain a *complete* stock, without being burdened with excessive inventory. Bush standardization makes this possible.

LOOK AT THESE COMBINATION POSSIBILITIES !

A Cooling Tower (with exclusive Copper Decking) can be used with either Propeller Fan or Blower Fan.

A modern Evaporative Condenser by simply replacing the Copper Decking with Bush's exclusive Inner-Fin coil.

Cooling Tower or Evaporative Condenser, you'll be completely astounded by the *compact size.*

See for yourself and be convinced, by taking a look at Bush Booth No. 250 at the International Heating and Ventilating Exposition in Philadelphia, January 24 to 28.

BUSH

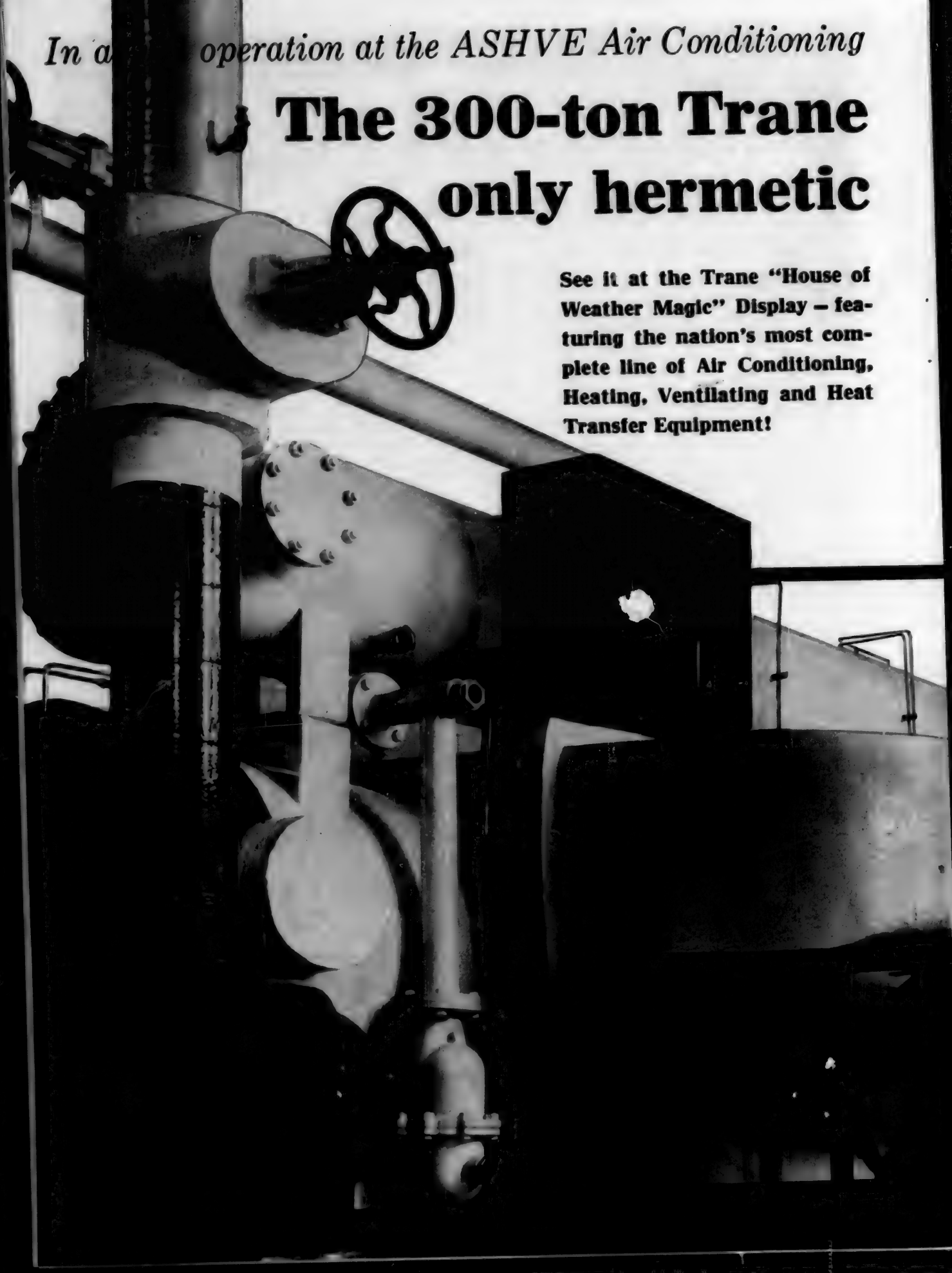
BUSH MANUFACTURING COMPANY

WEST HARTFORD 10, CONNECTICUT

In a[illegible] operation at the ASHVE Air Conditioning

The 300-ton Trane only hermetic

See it at the Trane "House of Weather Magic" Display – featuring the nation's most complete line of Air Conditioning, Heating, Ventilating and Heat Transfer Equipment!



Exposition! **JANUARY 24-28, CONVENTION HALL, PHILADELPHIA.**

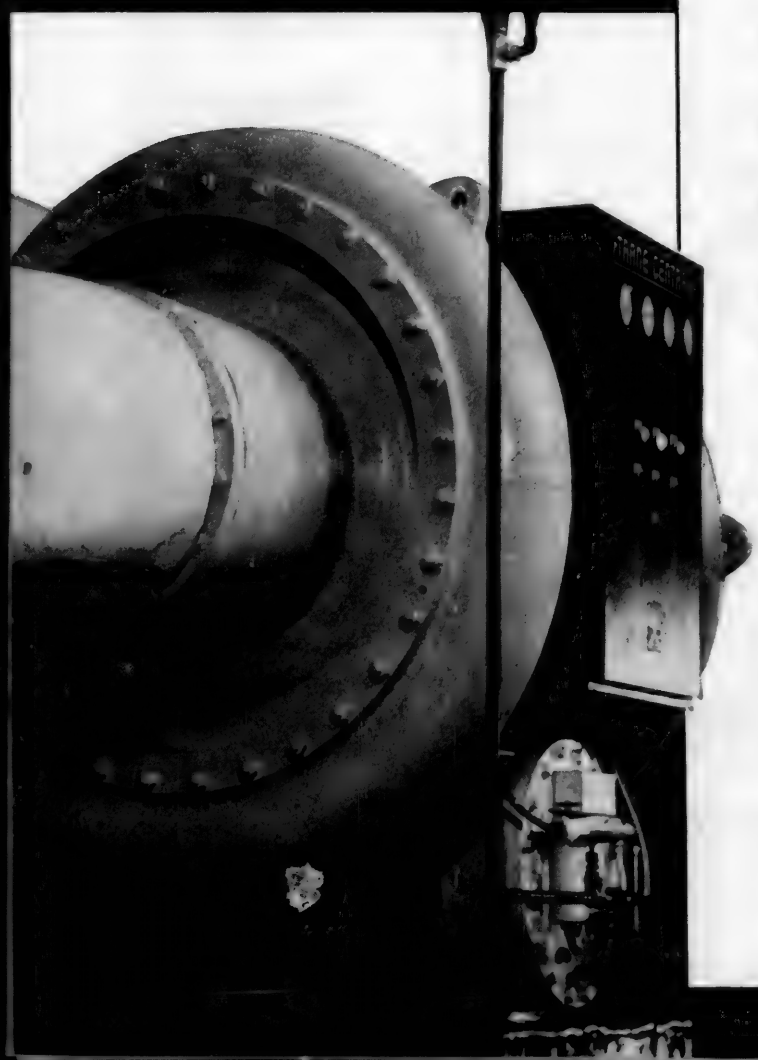
CenTraVac®—the industry's centrifugal compressor!

Only TRANE offers you *matched* products in *all four* fields: (1) air conditioning, (2) heating, (3) ventilating, (4) heat transfer.

TRANE products are designed and built for use *together*. And that means greater "system" dependability . . . year after year.

Make TRANE your *one source* of supply. Concentrate responsibility—simplify procurement.

Contact your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.



Here's what you'll see at the Trane "House of Weather Magic" operating display

★ **TRANE CENTRAVAC!** 300-ton hermetic centrifugal compressor that meets smaller load requirements by automatically throttling down to *as low as 10% of rated capacity.*

★ **NEW UNITRANE!** UniTrane room air conditioners *in operation!* New combination water volume and motor speed controls . . . new reversible coil and drain pans . . . new accessibility. And new, modern cabinets, more compact than ever!

★ **MULTIZONE CLIMATE CHANGER.** Heating or cooling for one to six zones from this one TRANE unit. Operate it yourself.

★ **KB UNIT VENTILATOR!** See how the revolutionary new Kinetic Barrier Action stops drafts before they start by blanketing walls of glass with a *forced upward flow* of tempered air. New 28" model in operation.

★ **UNIT HEATERS!** Horizontal and projection models . . . featuring TRANE's exclusive Louver Diffusers for complete control of heat distribution patterns.

★ **COLD GENERATOR!** See it operating with a TRANE Climate Changer. And be sure to see the unique compressor servicing display demonstrating TRANE's *interchangeability* of parts!

★ **NEW DELTA-FLO COIL!** Special demonstration proves greater efficiency of the new Delta-Flo Fin.

★ **TRANE RADIATION LINE!** Featuring the new Wall Line Convector.

See you at the show!

TRANE

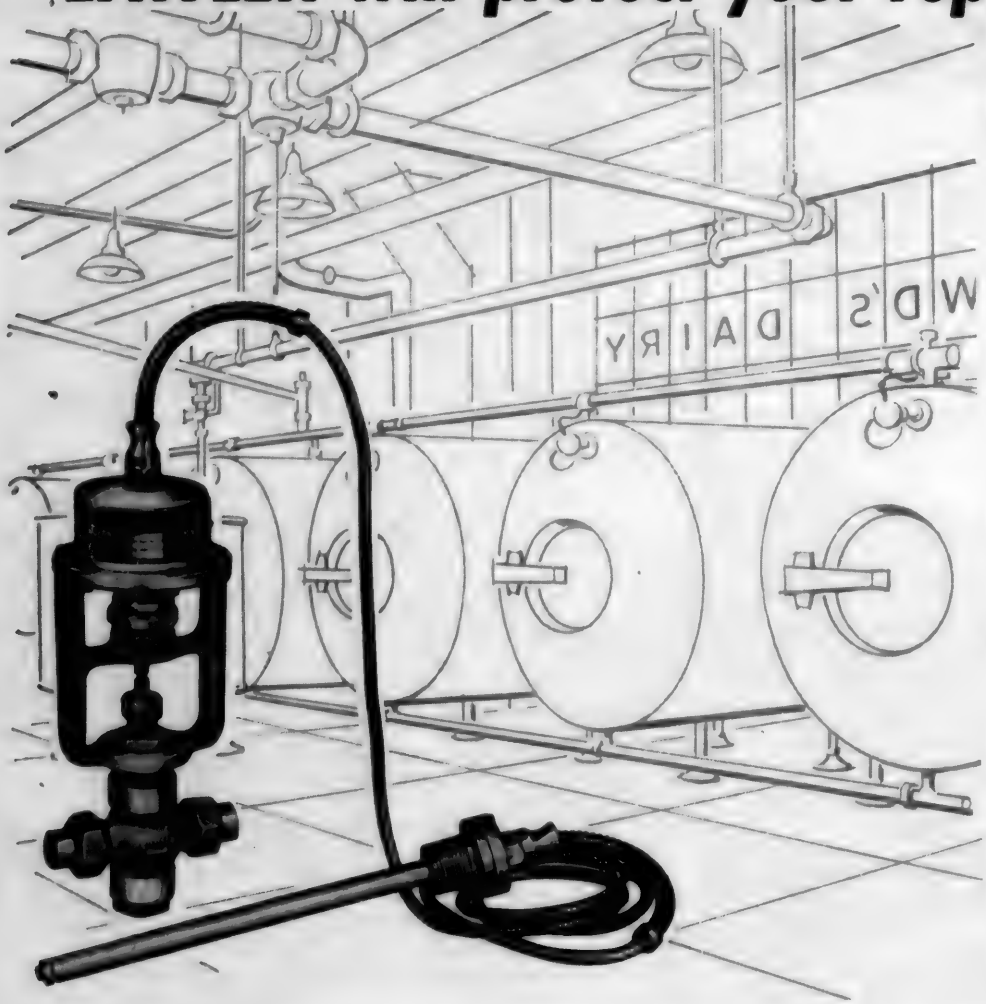
MANUFACTURING ENGINEERS

One source, one responsibility for:
Air Conditioning • Heating • Ventilating
Heat Transfer Equipment

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa.
Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 15 Canadian Offices

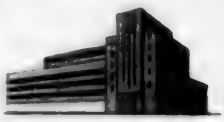
NOW, and TEN YEARS from now—

LAWLER will protect your reputation!

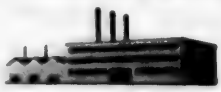


IN FACTORIES

POWER PLANTS



COMMERCIAL BUILDINGS



PROCESSING PLANTS

DAIRIES

INSTITUTIONS

SHIPS

. . . Wherever Steam is Used

Type "S" Thermostatic Temperature Regulator for automatically regulating the flow of liquid or steam through a valve . . . in a dairy, for example, which is illustrated above.

Lawler's "Performance-Tested" design combines pioneering experience with engineering leadership. The use of specially chosen metals assure YOUR customers years of positive, accurate temperature control with lowest maintenance cost . . . the best insurance YOUR REPUTATION can have.

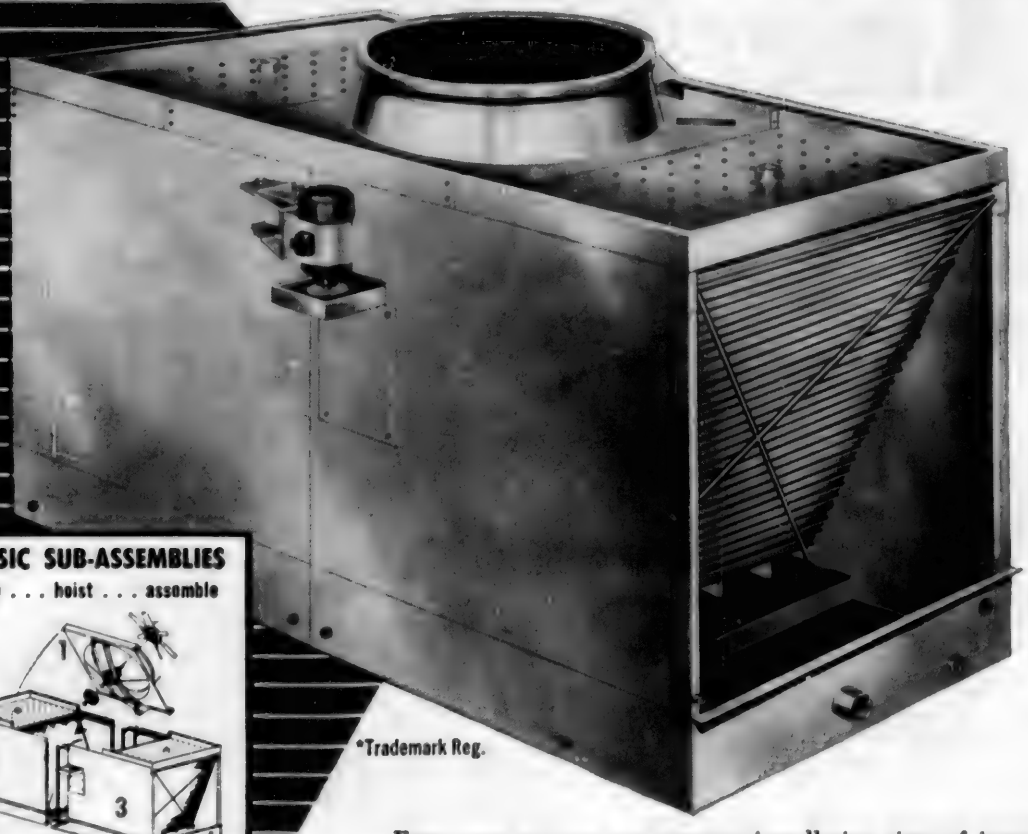
"Performance Tested" for Longer Life

The Lawler Line **of Thermostatic Controls**

LAWLER AUTOMATIC CONTROLS, INC. 453 North MacQuesten Parkway, Mount Vernon, N. Y.

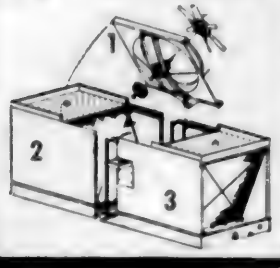
New "PACKAGED" Double-Flow* Aquatowers

... the calendar for a CLOCK



*Trademark Reg.

3 BASIC SUB-ASSEMBLIES
to ship . . . hoist . . . assemble



From now on, you can measure installation time of intermediate capacity cooling towers in *hours* — not days! The secret to this saving of time and money is Marley's new "packaged" Double-Flow Aquatower, available in a range of sizes for refrigeration, air conditioning and industrial service.

Packaged steel Double-Flow Aquatowers are delivered to the job in three basic sections, each completely pre-assembled at the factory. At the tower site, these three sections can be easily hoisted and quickly bolted together with a minimum of labor and equipment. Simplified piping and grillage also help cut erection cost to a fraction of the normal installation expense for towers of like capacity.

Marley's unique new towers offer every operation economy of larger Double-Flow Aquatowers, every installation economy of packaged Marley Aquatowers. For complete data on design, construction, engineering and performance, just call your Marley Application Engineer in any of 55 cities.

To be shown in Booth 325 at the International Heating and Ventilating Exposition

MARLEY

The Marley Company
Kansas City, Missouri

Whatever you do...
don't miss the

American Blower
exhibit

at the

INTERNATIONAL EXPOSITION!

Booths 22 & 24

See

all new American Blower products for heating, ventilating, air conditioning!

Visit

the American Blower Exhibit at the International Heating and Ventilating Exposition at Commercial Museum, Philadelphia, January 24th through the 28th, 1955!

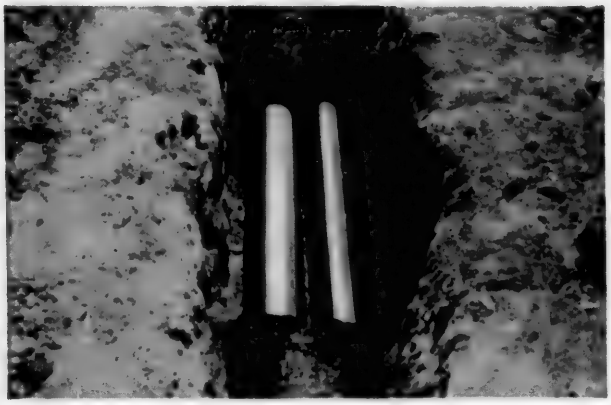
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

Serving home and industry:
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

3 Big Reasons Why

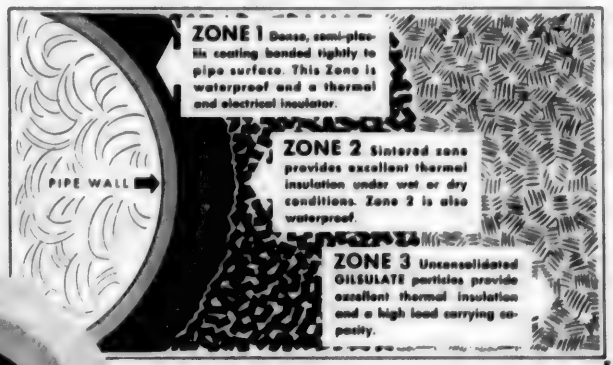
1. GILSULATE—Easy to install—Just pour it on, tamp it down and backfill. Run heat through the pipes (up to 520°F)...and the job is completed. No need to remove rocks from backfill; no problems of cramped space or multiple piping.

more and more hot underground pipe gets insulated



2. GILSULATE—Cost Less per Installed Linear Foot—No skilled labor needed...requires no mechanical sheaths, special protective devices, or costly installation procedures.

with new modern triple-zone GILSULATE®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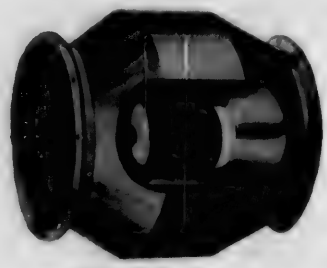

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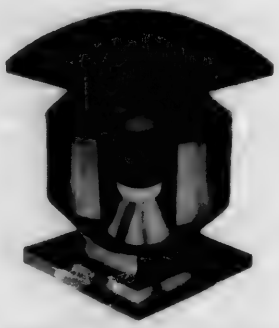

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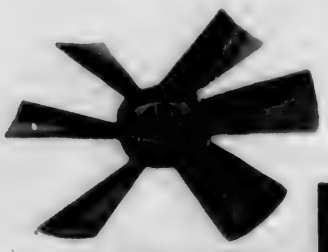

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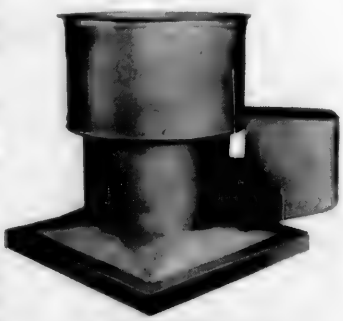

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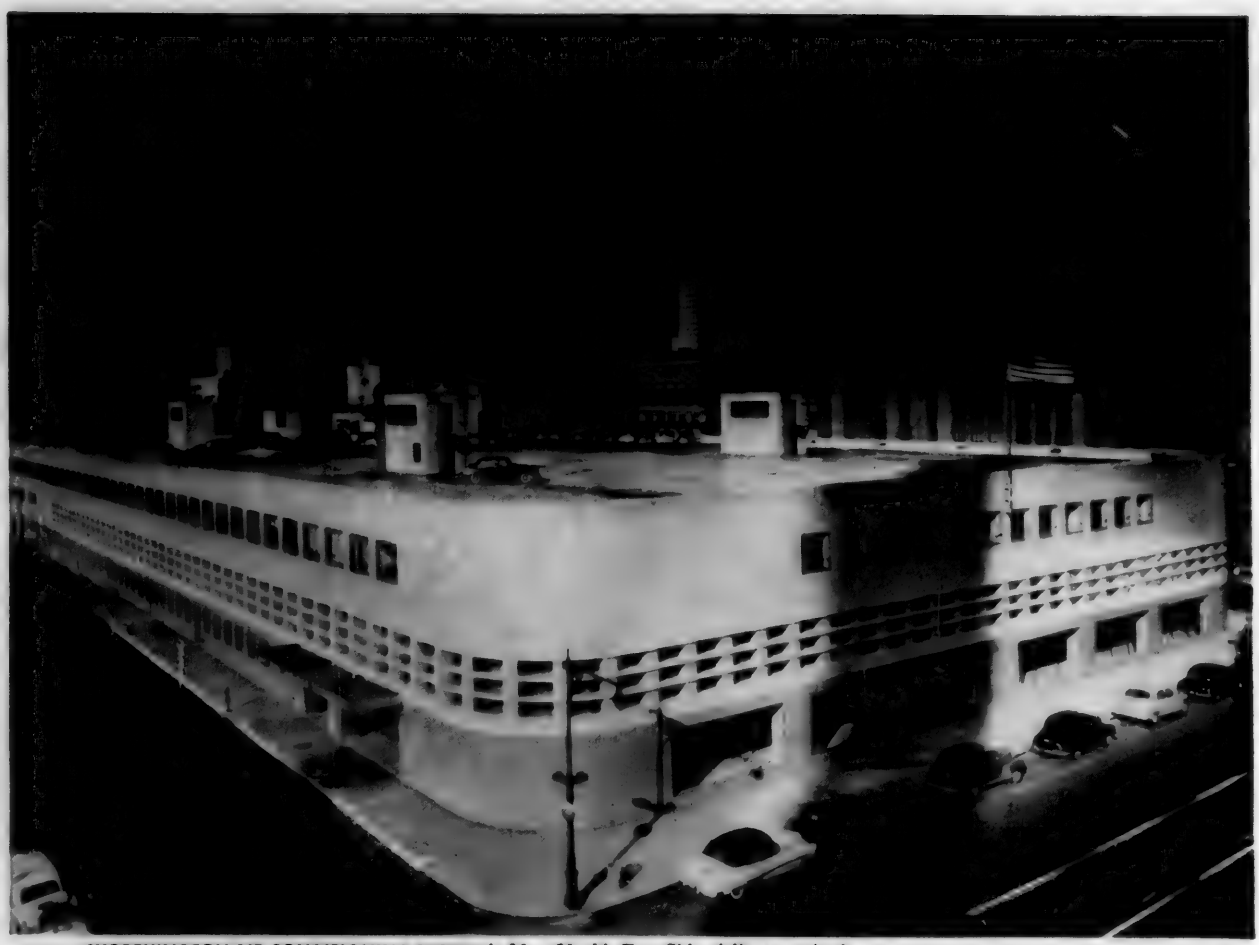

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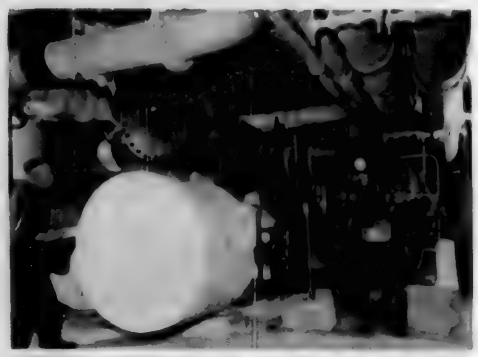

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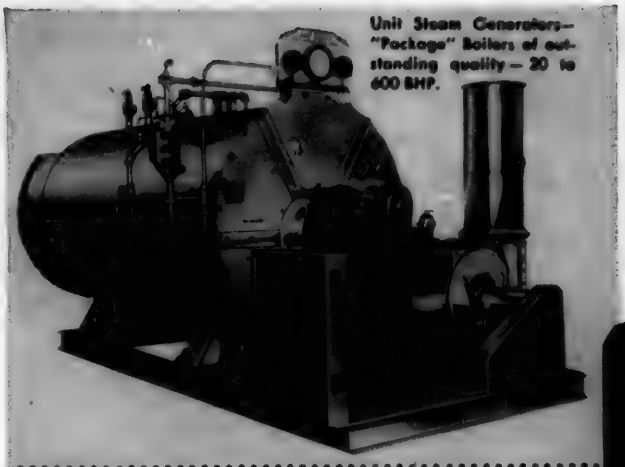

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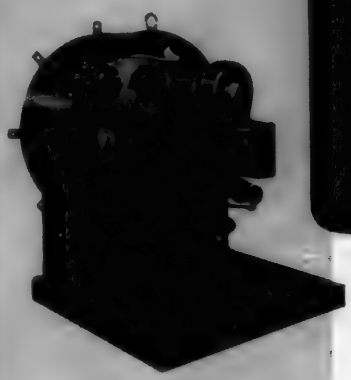

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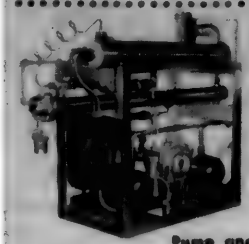

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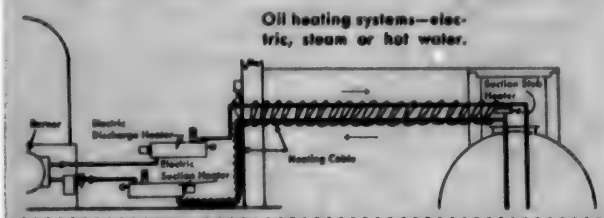

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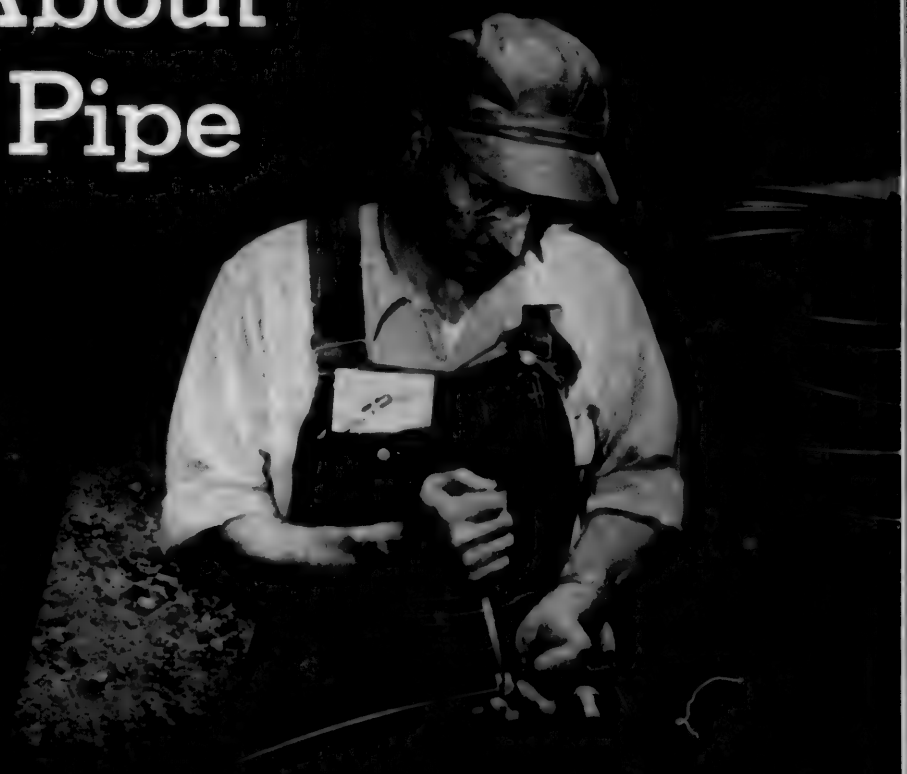

For a long time, many have wondered whether plastic pipe should be used in a piping design, what plastic material is best for some specific job, and what the limitations are for plastics used in pipe. Here is a factual presentation of the advantages and disadvantages of the many types of plastic pipe, principal uses for these types, physical properties, and how the pipe is joined and installed.

PLASTIC pipe for conducting water, gas and oil was unknown a few years ago. Today there are few distributor warehouses, handling metal pipe or water pumps, which do not stock plastic pipe.

Corrosion resistance was a primary factor in the development and expanded use of plastic pipe. Because of high replacement costs of steel pipe for mine drainage lines, mine drainage provided a receptive market for plastic pipe. The service life of plastic pipe for such drainage lines was not only much greater than steel, but installation costs were considerably lower. The reduced costs were due to the light weight, longer lengths, flexibility, and easier joining devices.

This successful application and general acceptance by the mining industry spurred market development. Raw material manufacturers and pipe extruders soon developed new materials and expanded uses. It was not long before plastic pipe was used in jet pump installations, domestic cold water systems, golf course water lines, in the oil fields for conducting oil-bearing brine waters and crude petroleum, and in many industrial applications.

Plastic pipe is not an overall substitute for steel or iron pipe, since it has limitations in tensile strength, working pressures and temperature. However, where such limitations are not restrictive, it can be used to good advantage because it has resistance to corrosion, light weight, chemical resistance, reduced flow friction, and is easily installed.

Types of Plastic Pipe

All types of plastic pipe are not alike. Different raw materials have been developed suitable for plastic pipe, each having its own advantages and limitations, each having its own special properties. The principal types now in use, and a description of their properties and principal uses follow:

Polyethylene, Flexible Type—Its principal uses are in cold water service, especially jet pump settings and rural domestic water systems, also mine drainage and conducting low temperature corrosive solutions in industrial installations. Among its advantages, it is available in long lengths, is flexible, has high impact, is the lowest cost plastic pipe, and is the easiest to install. It is limited in use to a low pressure and temperature range, and may be damaged by careless handling. Polyethylene is by far the most widely used material, probably accounting for over 70% of all plastic pipe made.

Cellulose Acetate Butyrate, Tenite II, Semi-rigid Type—The principal uses for butyrate pipe have been crude oil gathering lines, salt water disposal lines, low pressure water lines, gas service lines, and reliner tubing for corroded steel gas piping. Among its advantages are simple and economical installation, light weight, low frictional

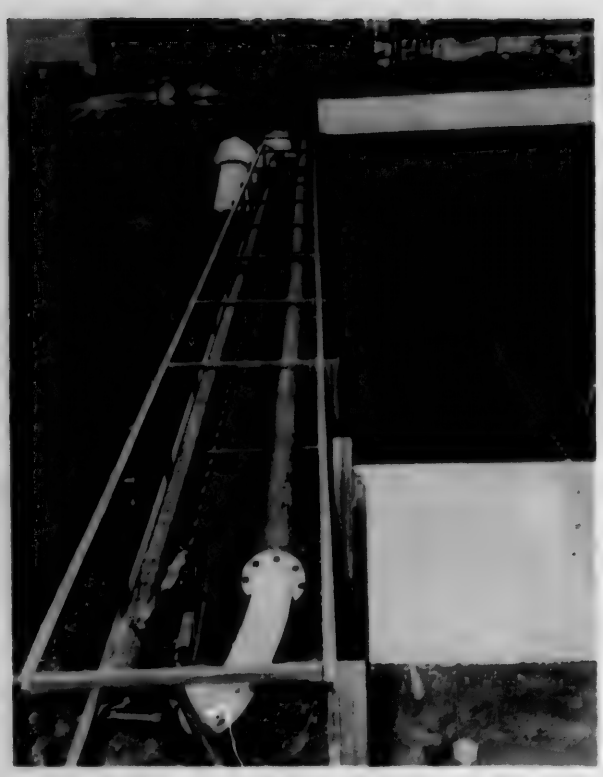

Fig. 1. Skating rink installation showing the connection of polyethylene plastic pipe to a metal header.

loss, resistance to paraffin build-up on crude oil gathering lines, resistance to corrosive action of certain soils, and comparatively low price. It is limited by its suitability for low pressure and low temperature applications, and being resistant only to a somewhat narrow range of chemicals.

Polyvinyl Chloride, Rigid Type—Polyvinyl chloride is one of the latest materials to be used for pipe. Its principal uses are generally in the same fields as that of butyrate pipe. There are two general categories in vinyl pipe:

(a) *High Impact.* The materials used in such modification, somewhat lower the chemical resistance of the polyvinyl chloride.

(b) *Normal Impact.* Pipe is made of unplasticized resin. This has excellent chemical resistance, but it is more brittle.

Rigid vinyl pipe is limited because of a higher price than other thermoplastic pipe and because it is available only with threaded fittings, requiring heavy wall pipe to accommodate threads. Cement type fittings will soon be available, which will enable pipe manufacturers to offer a lighter wall pipe with satisfactory operation at higher pressures than presently possible with other plastic pipe. This type of pipe is further limited by low temperature operation.

Styrene Acrylonitrile Copolymer, Kralastic—Its principal uses are generally the same as those for butyrate and polyvinyl chloride pipe. It is also used extensively in industrial applications. Among its advantages are good chemical resistance, high impact strength, and general toughness. It is light in weight and can be easily installed with threaded fittings or with solvent welded fittings and joints, both of which are generally available.

Vinylidene Chloride, Saran, Semi-rigid Type—Vinylidene chloride is one of the first materials to be used in the manufacture of plastic pipe and fittings. Its chief advantage is its excellent chemical resistance and it is in this field that it has found its greatest use, the handling of chemicals. Saran is extremely brittle at lower temperatures and this has been its chief disadvantage.

Fiberglass Reinforced Plastic Pipe—Polyester resins and glass fiber mats are combined to form a very strong thermosetting plastic pipe. It is suitable for carrying oil and oil products, natural gases and a variety of chemicals, including acids and alkalies. Its advantages are that it can be used at higher temperatures and pressures than thermoplastic pipes. Its use is limited by high cost and there are further limitations with fittings and connections. Some of these limitations will undoubtedly be elminated through research and development work now going on.

Applications

Because of its many unique and special properties, plastic pipe is found in an ever-expanding variety of uses. It is interesting to note the large number of applications for which plastic pipe has already been found suitable. In many such uses, it is largely replacing metal pipe.

Domestic Water Systems, Rural and Residential—Jet pump settings, submersible pump settings, low pressure cold water distribution lines, and lawn sprinkler systems.

Commercial—Golf course water systems, cold water service from municipal mains with heavy duty plastic pipe, artificial ice skating rinks, Fig. 1, piping for radiant heat installations, Fig. 2, cold water lines in air conditioning systems, Fig. 3, irrigation systems within the

Fig. 2. Radiant heating installation for a small manufacturing plant.

TABLE 1—STANDARD SIZES OF POLYETHYLENE PIPE

Nominal Pipe Size, Inches	O.D., Inches	I.D., Inches	Recommended Working Pressure, psi, at 73.4F
½	0.840	0.622	104
¾	1.050	0.824	86
1	1.315	1.050	81
1¼	1.660	1.380	68
1½	1.900	1.610	61
2	2.375	2.067	52
3	3.500	3.068	50
4	4.500	4.026	42
6	6.625	6.065	31

pressure limitations of the pipe, gas service lines and reliners.

Industrial—Oil field piping, salt water disposal lines, crude oil gathering lines, natural gas lines, mine drainage lines, lines for conducting corrosive solutions in industrial plants, air lines, conduit, and fresh water lines.

Installation of Plastic Pipe

Installation instructions recommended by the larger manufacturers are now generally uniform. The standard practices employed in the installation of the most widely used plastic pipes are listed in the following paragraphs:

Polyethylene, Flexible Type—It is available in sizes ½-inch through 6 inches. Sizes through 3 inches may be obtained in long coils and 4-inch and 6-inch sizes in straight 20-foot or 25-foot lengths. The long coils contain the following feet of pipe based on pipe diameter:

½ and ¾-inch diameter—400 ft
1 and 1¼-inch diameter—300 ft
1½-inch diameter—250 ft
2-inch diameter—200 ft
3-inch diameter—100 ft

Flexible pipe is installed by means of insert type fittings secured by stainless steel clamps as illustrated on page 87. The material most commonly used in fittings is a high impact styrene compound. Fittings are available in a variety of types, such as ells, tees, couplings, reducers, and adapters for attaching to metal. Metal fittings are also available. By means of a special plastic to solder the insert stub, a wide variety of sweat type fittings can easily be assembled. Special compression fittings and special purpose fittings for well settings are also available from most manufacturers. Polyethylene pipe may be cut to length with a hack-saw or pocket-knife. The serrated insert fittings are pushed into pipe and the clamps tightened with a screw-driver.

Care must be exercised in the installation of all plastic pipe, but especially polyethylene pipe, since it is softer.

TABLE 2—SIZES FOR RIGID AND SEMI-RIGID (SWP) PIPE

Nominal Pipe Size Inches	I.D., Inches	O.D., Inches
½	0.50	0.600
¾	0.75	0.855
1	1.00	1.14
1¼	1.25	1.42
1½	1.50	1.73
2	2.00	2.25
3	3.00	3.25
4	3.80	4.10
6	5.76	6.22

W. E. Jacobsen, general manager, Yardley Plastics Company, has been with this company since it was organized in 1941. For a time he operated his own contracting business, and for over seven years was an accountant with an eastern public utility. He became assistant general manager of Yardley in 1950 and one year later was promoted to general manager. In addition, he is an officer and director in Canadian affiliates. He is a member of the Society of Plastic Engineers; a member, Executive Committee, Thermoplastic Pipe Division, The Society of the Plastics Industry.

All trenches should be smoothly compacted and have no protruding rock. Backfilling should be done with care, to prevent damage to the pipe. In order to allow for a high coefficient of contraction and expansion, pipe should be snaked in the trench.

Suspended installations of polyethylene pipe should be supported by hangers, each twelve diameters of pipe through 1-inch size and each eight diameters above 1-inch. The same formula can be applied to semi-rigid and rigid plastic pipe.

Standard Pipe Sizes

The plastic pipe industry has promoted and accepted as commercial standards, the sizes for polyethylene pipe as given in Table 1.

The recommended working pressures in Table 1 are not a part of the commercial standards. They represent the maximum working pressures generally accepted by the industry for the dimensions listed.

The plastics industry has recognized the difficulties involved in designing a water system requiring different sizes of pipe with such a variety of recommended working pressures. As a result, many companies offer pipe with a uniform working pressure for all sizes. Such lines have been developed for 75, 100 and 125 psi working pressures. It is anticipated that industry standards will soon be developed for uniform pressure rated lines.

Rigid and Semi-Rigid Types—Plastic pipe is generally available in sizes ½ inch through 6 inches, and are extruded in Schedule 40 and Schedule 80 dimensions, as well as a solvent welded pipe (SWP). This size (SWP) has been developed by the industry and been adopted quite universally. The SWP sizes are as given in Table 2.

Pipe Fittings

Both threaded and cement type fittings are available for rigid and semi-rigid types. Standard fittings, such as ells, tees, couplings and reducers are generally available as well as flanged fittings and other special fittings.

No special techniques are required in the assembly of pipe with threaded fittings. Anyone with experience in assembling metal pipe can, with normal care, assemble threaded plastic pipe with no special instructions. Since some formulations of pipe dope attack plastic pipe, the recommendations of the manufacturer should be carefully observed.

Care must be exercised, however, in the assembly of cement type fittings in order to obtain a leak-free, permanent bond. Solvent is applied to both pipe and fitting surfaces, Fig. 4. Pipe is carefully inserted in fitting to

Fig. 3. Polyethylene pipe used for cold water lines on an air conditioning unit in a Columbus, Ohio restaurant. Overhead pipe is supported by hangers.

obtain a welded joint. It is essential to allow solvent welded joints to dry thoroughly so the weld may become permanently set. The techniques and the solvents used with the different types of rigid pipe vary slightly and users are urged to carefully follow the manufacturer's instructions in the making of solvent welded joints.

Thermal Expansion

If plastic pipe is handled like conventional metal pipe, unsatisfactory installations will result. Misapplication is the principal source of installation failure. Installers must learn its limitations and use it in applications where its properties can be employed to advantage.

The thermal expansion of plastic pipe is much greater than that for metal. It expands as much as .022 inch per degree Fahrenheit in a 20-foot length, depending on size. Therefore, great care must be exercised in making installations to compensate for such thermal expansion. Generally, it is recommended that long lines be snaked wherever possible and that before covering, especially in hot weather, the new line be run on open discharge until operating temperatures are reached. For specific data on thermal expansion values for the principal thermoplastic pipe materials, see Table 3.

TABLE 3—THERMAL EXPANSION VALUES (IN./FT./°F) FOR THE IMPORTANT THERMOPLASTIC PIPE MATERIALS

Material	Inch per Foot per deg F
Polyethylene	.00108
Butyrate	.00118
Polyvinyl Chloride	.00054
Kralastic	.00067
Saran	.00126

TABLE 4—RECOMMENDED OPERATING PRESSURES FOR 1-INCH PLASTIC PIPE, SCHEDULE 40 I.P.S.

Temp. F	Type of Plastic Pipe				
	Polyethylene	Butyrate	Kralastic	Vinyl	Saran
73.4	101	126	260	225	140
100	71	111	227	...	...

All thermoplastic pipes are limited to a narrow range of operating temperatures. Pressure resistance drops off sharply as the temperature increases, the practical upper limit for these materials being in the range of 120 to 150F. In addition, the resistance of the pipe to external damage decreases with increasing temperatures. As the temperature decreases, these materials tend to become more brittle. Except for polyethylene, which retains a certain amount of flexibility down to temperatures in the range of —80F, most of them shoud be protected from shock when the temperature is below freezing. Freezing of water, not under pressure, in polyethylene pipe lines will not damage the pipe itself, although the fittings may be cracked.

Safe Working Pressures and Pressure Drop

Safe working pressures at various temperatures vary from one type of plastic pipe to another. Table 4 shows recommended maximum working pressures as shown by manufacturers who are now producing the type of pipe indicated. In order to reflect a fair comparison, these recommendations have been adjusted so that they apply to 1-inch pipe in Schedule 40 steel pipe dimensions, even though the pipe may not be made in the dimensions of that standard.

Table 5 gives heat distortion values for the different thermoplastic materials. These also show considerable variation.

Plastic pipe has smooth interior surfaces and the resistance to fluid flow is small. Being unaffected by elec-

Fig. 4. Cement is applied to join two lengths of plastic pipe.

TABLE 5—HEAT DISTORTION TEMPERATURES OF THERMOPLASTIC PIPE MATERIALS

Material	Load, PSI	Heat Distortion Temp., F
Polyethylene	66	105-110
Cellulose Acetate Butyrate	66	171
	264	146
Polyvinyl Chloride	264	160
Kralastic	264	187
Saran	264	130-150

trolytic corrosion, the pipe walls remain smooth, with no increase in resistance to flow over extended periods of time. Materials deposited from the fluid being transported do not cling to the smooth walls of the pipe, so there is much less clogging from this reason.

Through a research project carried out at the hydraulics laboratory of the University of Iowa, fluid flow charts for plastic pipe have been developed. These indicate that under comparable conditions, the delivery from a plastic pipe may be up to 25% greater than that from a steel pipe. Table 6 shows the comparative pressure drop, in pounds per square inch, in plastic pipe and steel pipe, for various rates of flow through 1-inch pipe. Complete data for other sizes of pipe are generally available from the manufacturers. This table also shows "C" values, as they were calculated by the Hazen and Williams pipe formula.

Chemical Resistance of Pipe

All plastic pipe has resistance to certain chemicals. The tabulation in Table 7 provides only a guide for the chemical resistance of the various plastic materials and some of the more common chemicals encountered. Manufacturers of the various plastic materials used in pipe have developed extensive chemical resistance tables, which data are readily available from most plastic pipe manufacturers.

Research and Standards

The manufacturers, in the interests of the industry and users of plastic pipe, are setting up standards for the various types of pipe. Also, they are carrying out research and development programs which are destined to increase the quality, open up new fields of application, and push back the limitations which now apply in many potential applications.

Working on standards for the various types of plastic pipe are a number of committees of the Thermoplastic Pipe Division of the Society of the Plastics Industry (S.P.I.). These committees are working closely with the American Society for Testing Materials, and the American Standards Association, in order to make standards uniform throughout the industry.

The same division of the S.P.I., along with the principal suppliers of thermoplastic pipe materials, are supporting a research program being carried out by Battelle Memorial Institute, Columbus, Ohio. This research program is designed to develop test methods for plastic pipe, also the engineering limitations and safety factors which should be applied to plastic pipe, to provide satisfactory service over extended periods of time.

A two-year research program, carried out by the National Sanitation Foundation at the University of Michigan, was designed to determine the toxic effects, if any, of various plastic pipe materials. This program is now practically completed. A preliminary report submitted to the Journal American Water Works Association, by Walter D. Tiedeman, Executive Director, National Sanitation Foundation Testing Laboratory, established the fact that none of the thermoplastic pipe commonly being used has any toxic effect on potable water coming in contact with it.

TABLE 6—COMPARISON OF PRESSURE DROP

Psi per hundred feet of 1 inch Schedule 40 (I.P.S.) in plastic pipe and steel pipe, at various rates of flow

Gallons Per Minute	Plastic Pipe C = 140	Steel Pipe C = 100
2	0.13	.26
3	0.26	.54
4	0.44	.93
5	0.62	1.40
6	0.84	1.97
8	1.38	3.35
10	2.12	5.03
20	7.15	18.25

TABLE 7—RESISTANCE OF PLASTICS TO CHEMICALS

Chemical	Polyethylene	Polyvinyl Chloride	Kralastic	Butyrate	Saran
Acetic acid	U	O	O	U	S
Sulfuric acid	S	O	O	U	O
Hydrochloric Acid	S	S	S	U	S
Nitric acid	U	O	O	U	O
Citric acid	S	S	S	O	S
Calcium hydroxide	..	..	S	..	S
Ammonium hydroxide	S	..	S	U	U
Sodium hydroxide	S	S	S	U	U
Calcium chloride	S	S	S	S	U
Methyl alcohol	U	O	S	U	S
Ethyl alcohol	U	O	S	U	O
Glycerine	S	S	S	S	..
Acetone	U	U	U	U	U
Gasoline	U	..	U	O	O
Benzene	U	U	U	U	U
Propane gas	U	..	..	S	..
Crude oil	..	..	..	S	..
Turpentine	..	..	..	O	O

S—Satisfactory; U—Unsatisfactory; O—Satisfactory under a limited range of concentrations and temperatures—should not be used without first being proved for the particular application in mind.

Selection Is Important

As has been previously mentioned, plastic pipe is a special purpose product. Those using it must learn to select the right pipe for each use. If recognition is given to its limitations, and selection made on the basis of suitability, plastic pipe will be an economical solution to many piping problems. It will cost less, generally, than other types of corrosion-resisting piping; it will outlast metal piping; its installation will be simpler and cheaper; and, it is believed, will be more sanitary.

The plastics industry is constantly developing new materials and improving those now in use. This holds promise of continually improved pipe materials, which will lead to ever-expanding markets and also to new applications for the pipe.

High Velocity System Design

LEONARD R. PHILLIPS

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In design theory, there is no basic difference between an all-air high velocity system and a conventional air conditioning system. Nor is the central equipment basically different. There are, however, practical application suggestions gleaned from the experience of designers of many of the present installations. Some of these suggestions are collected here in order to help avoid the minor errors which may have characterized early experience. This resume is not expected to be complete, and the author would appreciate receiving comments and suggestions from the experience of others.

LOADS and distribution calculations are identical for both high and low velocity air systems. Both the dual duct and single duct high velocity systems lend themselves conveniently to perimeter and inside zone applications. Balancing and static pressure adjustments are simple and uncritical. As a matter of fact, factory calibrated pressure reducing outlet units are available for regulating air supply quantity by simply adjusting air passages and measuring the static pressure at a convenient tap.

Design of terminal outlets has progressed to a point where excessive noise, the biggest bugaboo of high pressure or high velocity systems has been eliminated. Units have been designed and tested for quiet installations in hospital and hotel bedrooms. They can be selected with the engineering data available for any type of application. For this reason, no more will be said here about this phase of the design. Application data for the terminals are available from manufacturers' literature.

Low side cooling equipment is selected as for any conventional air conditioning system. However, for the purpose of further reductions in duct sizes beyond the economies realized from increase in air velocity, larger temperature differentials are often used. Increasing the temperature differential involves a loss in efficiency in the refrigeration cycle which may be offset by advantages to be discussed later.

Fan equipment for high velocity systems is quite similar to that for conventional systems except that selection is made in the Class II category. It is usually in the interest of fan horsepower economy to design within the limits of Class II fans.

Some manufacturers have responded to demand by designing more quiet fans with special air-foil blades. In general, however, it is still necessary to install a sound trap or absorber between the fan and the duct system to remove low frequency noise caused by the fan.

A few frequently overlooked points can be suggested regarding known methods of duct system design.

(1) Design longest runs for a definite pressure drop by equal friction method using best judgment between a value of 1 inch w.g. pressure loss per one hundred feet, and a total pressure drop of about 2.5 inches for the actual duct system. These criteria are based on a compromise between economy of space and economy in fan horsepower and operating cost. Where conditions warrant, up to 5 inches pressure loss may be used.

(2) Re-figure static pressure in main ducts using static regain method (providing transition pieces are reasonably tapered). Use the factor 0.5 in the equation

$$SPR = 0.5 \frac{V_s^2 - V_f^2}{(4005)^2}$$

where V_s is initial velocity and V_f is velocity after reduction, both in fpm; SPR is static pressure regain in inches w.g.

The fan static required in the original calculation may be reduced by the amount of regain so calculated.

(3) Increase the duct size of the end section of the longest duct run or several of the longest runs if they are about equally long. The regain of static pressure thus obtained by reducing the velocity in these end sections may also be deducted from the fan static originally calculated.

(4) Decrease the duct sizes for short branch runs, particularly those nearest the fan. At these points there is an excess of static. Instead of "killing" this static in the high velocity terminal, using it up in higher friction by increasing the connecting duct velocities results in further duct economies and in a more quiet job.

(5) For the last terminal unit of the longest run, whether it be an individual high velocity plenum or an acoustic terminal feeding several low velocity outlets, select what would be normally an over-size unit with low minimum static pressure. This saving in static pressure, while it may cause a small increase in price for the one larger unit, cuts down the fan static of the entire system.

(6) It is not probable that each unit on a large controlled duct system will be calling for its maximum design air quantity at the same time. By a study of the individual requirements and detailed loads of a job, a reasonably conservative estimate can be made of a factor to be applied, by which the air requirements may be

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cut down. For dual duct systems the reductions should be applied separately to the hot and cold ducts because their probability factors are most often different.

As an example, on certain large jobs some designers have cut the air requirements and ducting down as follows: to 70% of the original design on the outlets nearest the fan; to 80% on the next farthest group; to 90% on more distant units and retaining the full 100% of design on the last group at the end of the run.

Design Criteria

(1) The prime air quantity supplied through the duct system is reduced, of course, by increasing the temperature differential. It may be reduced further, by supplying all necessary fresh air in the prime air but reducing the latter by generating required room air changes through the use of 100% aspirating diffusers. These draw in a quantity of room air, mix it with an equal volume of prime air and diffuse the mixture into the space.

(2) The design wet bulb and dry bulb temperatures of the space may be shifted slightly from heretofore conventional values for two reasons: (1) The trend to improved environmental conditions is towards lower humidities, yet within the ASHVE comfort zone chart; (2) Design dry bulb temperatures, although down a few degrees because of present day occupants' habituation to air conditioning, may be raised back by several degrees because of the reduction in humidity.

(3) This shifting of the design conditions helps in overcoming the penalty of appreciably lower efficiency of the high side at the lower suction pressures which are needed to produce the low supply air temperatures involved in increased temperature differentials.

Fig. 1 is a typical graph of horsepower and Btu output against suction temperature. For example, consider that it be desired to cut the supply air quantity by one-third by operating with a temperature differential of 30 deg F instead of 20 deg.

In this case a suction temperature of 37F may be required instead of 47F. This 10 deg F drop in refrigerant temperature might involve a loss of 15% in capacity.

However, noting that the horsepower requirement drops also, it is possible on many machines to increase

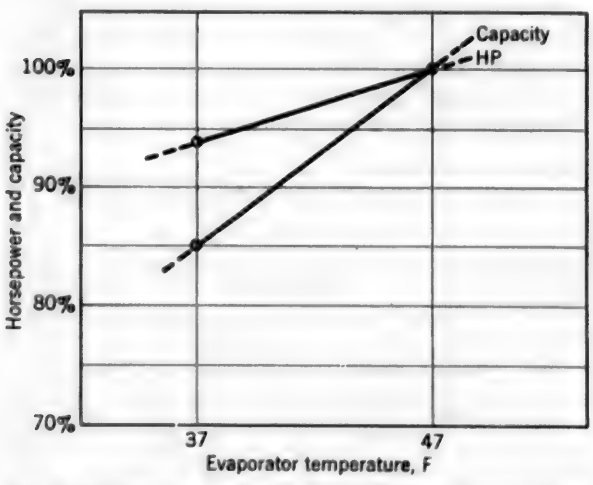

Fig. 1. Horsepower and Btu capacity vs. suction temperature.

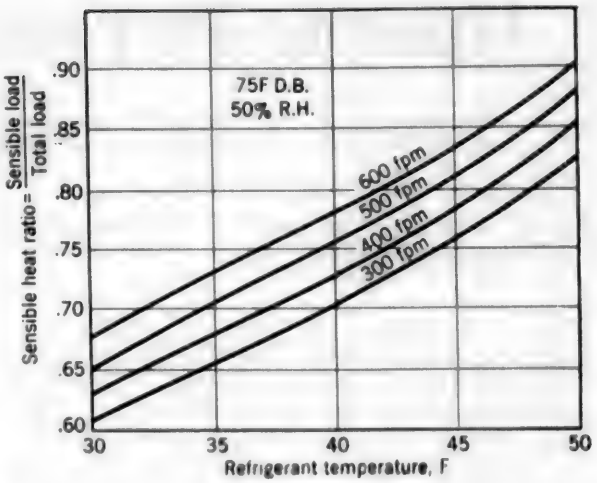

Fig. 2. Effect of coil face velocity on refrigerant temperature.

the compressor speed to a point where the horsepower required is the same. Thus by reference to Fig. 1 we can see that almost half the loss can be eliminated by this one suggestion alone.

(2) In the selection of the evaporator coil, definite steps can also be taken to raise the refrigerant temperature required by the conventional design several degrees and thus, with the other design suggestions already given, nullify the loss in refrigeration capacity or efficiency which would ordinarily be anticipated.

By using a larger refrigeration coil of face area sufficient to keep air velocity in the order of 450 fpm instead of 550 to 600 fpm which might ordinarily be used, a 4 to 5 degree rise in refrigerant design temperature can be effected. The graph, Fig. 2, illustrates these values for one set of air inlet conditions.

Summary

(1)—Design Conditions.

A. Cut supply quantity where possible without changing fresh air requirements by using higher temperature differential.

B. Cut supply quantity by using high induction terminals which re-circulate room air mixed with supply.

C. Lower design wet bulb of space.

D. Raise design dry bulb of space.

(2)—Ducts.

A. Design long runs by equal friction at 1 inch w.g. per hundred feet.

B. Keep duct static within about 2.5 inches.

C. Refigure long runs by static regain method.

D. Over-size end section of longest run for further regain of static.

E. Design short runs at high velocities to kill excess static.

F. Use over-size terminal at end of longest runs.

G. On large jobs with automatic or other controls investigate use of a probability factor.

(3)—Refrigeration Equipment.

A. Speed up compressor to compensate for horsepower drop at lower suction pressures.

B. Decrease coil velocity to allow a higher refrigerant temperature for same load and supply conditions.

How to Improve V-belt Drives

PAUL C. ZIEMKE

Figures are given for the amount of slack to be taken up to correct sag in V-belt drives.

BELT manufacturers are constantly engaged in research that may show or uncover how belts may have longer life in service and what type of installation or servicing will give best results. Therefore, the plant engineer who has V-belt drives as part of the plant equipment, can easily benefit from the manufacturer's research program in order to obtain the most for money spent for drives.

There are many operating questions that come up and the one that is asked most frequently is:

"Will picking up the slack in the loose members of a V-belt overstretch the remaining units"?

Belt Length and Belt Sag

At first glance it appears that the slack belt is a manifestation of unbalance in tensions. Actually, it is merely a failure to understand the relationship between belt length and belt sag. Too many plant engineers have an erroneous idea of the relationship between belt units on a multi-belt drive.

Belt builders measure the distance between the drive and driven pulley grooves with the load on and with the belt in motion under average operating conditions. Each belt unit is then legibly stamped with an inspection number which gives the plus or minus tolerance of the belt as it functioned under load.

Meaning of Numbers

In looking over these tested belts, we notice that several are listed in categories above the base number of 50, and others are in the lower range below that number. Those units stamped below the 50 range are minus tolerances and those above the 50 range are plus tolerances. Each designation represents a difference of 0.1 inch. Actually, the maximum length of difference allowed between the extremes in measurement in a matched set is but 0.1 inch per 100 inches; or stated another way, 0.1 of 1%.

Obviously, to bring the shortest belt of the set up this fraction of an inch will have no adverse effect on the belt.

Table 1 presents the length between tangent points on the sheaves measured for the differential in length between separate units of belt, or the differential in length between the tight and the slack belt. The figures indicated are for 180 degree arc of contact on both sheaves. This varies slightly for other ratios of contact.

Maintenance men are apt to say that the slack units are unacceptable for use in a set because they are "three or four inches too long." This is really not the case with a new set, since Table 1 refutes that statement. Appearances are misleading under such conditions, for a two-inch sag on a center to center distance of 100 inches can readily be taken up by merely shifting the motor base 1/16 inch. Actually the movement is 0.054 inch.

Much of the concern over misfit belts can be traced to the condition of the sheaves since these will wear unequally for a number of reasons. Chief causes for such wear are (1) soft spots if of gray iron, (2) slipping of a member that should have been replaced before the condition became acute, and (3) the presence of abrasives in the atmosphere immediately adjacent to the drive.

Sheave Wear

Excessive sheave wear can also be traced to the work of careless mechanics who feel that the belt is slipping because the grooves are worn to a polished brightness. In the way of a novice, such a mechanic may try to reduce this glaze through abrasives or filing. This often results in a badly unbalanced job. The glazed condition is rarely ever the cause for slippage. In fact its presence would indicate, to an engineer, a sheave that is wearing exceptionally well.

Careless millwright work may result in misaligned shafts which cause some belt members to run tight and the balance loose a fractional inch. Misalignment of a fraction of an inch will cause excessive trouble. The extent of abnormal wear will depend on the number of grooves per sheave.

When converting former flat belt drives to V-belts, many engineers replace only the driver sheave since the crown on the driven unit tends to prevent the separate belt members from crowding or moving on to the middle of the pulley. While this is usually an excellent means of saving money set aside for conversion, it also can develop into something of a headache for the maintenance engineer. This is a time when he can really appreciate the benefits of belt matching so that he may apply the longer units to the crown (center) of the drive and the shorter belts to the outer edges. A partially converted drive of that type is no occasion for one to be miserly by attempting to patch an old set with a new belt or two. The resulting jam-up can be costly as the longer (old) members crawl over the new (short) members to the complete ruination of both.

TABLE 1.—SLACK TAKEUP FOR BELT DRIVES

Distance Between Centers, Inches	Sag in Inches						
	½	1	2	3	4	5	6
20	0.037	0.130	0.513	1.080			
30	0.025	0.095	0.343	0.780	1.51		
40	0.010	0.074	0.240	0.590	1.03	1.61	
50	0.008	0.028	0.200	0.440	0.83	1.27	1.86
75	0.004	0.018	0.170	0.300	0.60	0.87	1.25
100		0.025	0.054	0.120	0.40	0.66	0.94
200			0.030	0.060	0.21	0.37	0.42
300				0.035	0.16	0.29	0.35

Short Method for Estimating Electric House Heating Load

ROBERT E. SINCLAIR

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Based on a study that included a large number of test houses, a rapid method was developed for estimating the electric energy requirements for house heating.

HOW much gasoline would you need to drive a freight truck to West Workington Falls?

To answer such a question you could refer to handbooks for information on the energy content of gasoline, the efficiency of truck engines, the friction losses of bearings, and other factors needed for the calculation. Yet with all these refinements, the final estimate would not reflect the very real influence of the human factor—or how often does the truck driver stop for coffee.

What you would probably do is to look at the operating records of trucks, and find a factor of so much gasoline per ton mile. This factor, determined on the road rather than in the laboratory, is realistic—it is an embodiment of all factors, human and otherwise. Once having the proper factor, the computation of the gasoline required to propel a truck over a certain route becomes a simple matter, and the resulting estimate is accurate for all practical purposes.

Which takes us to the point of the discussion. Why not compute electric house heating requirements by using a factor determined by observation of houses presently heated by electricity. In addition to the usual considerations of heat transfer, this factor would comprehend all the heat gains and losses caused by occupants' activities and habits.

To refer again to the gasoline analogy, the comparable information required for computation is given in Table 1.

Such a factor for electric house heating computations was propounded some years ago by Homer Bender. He termed it the "heat factor." Widely acclaimed at the time, it seems to have become almost forgotten.

We will here explore the possibilities of the heat factor, and by simplifying it, perhaps restore it as a valuable tool in the field of electric house heating. By definition:

$$\text{Heat Factor, } F = \frac{\text{KWH} \times 1000}{V \times Dd} \qquad (1)$$

TABLE 1.—GASOLINE ANALOGY FOR ELECTRIC HOUSE HEATING

Item	Gasoline for Freight Truck	Electric Energy for House Heating
Factor	Gal. per ton mile	KWH per cubic foot of house per degree day
Load	Tons	Volume of house
Operation	Miles	Degree days

TABLE 2.—HEAT FACTOR FOR VARIOUS CONDITIONS

Location or Type of Heaters	Number of Houses Tested	Insulation	Type Window Glass	Average Heat Factor, F*
Heat pump	1	Ceiling and walls	Double	0.146
In rooms	68	Ceiling and walls	Single	0.277
In rooms	11	Ceiling only	Single	0.296
Central system	5	Ceiling and walls	Double	0.397
Central system	4	Ceiling and walls	Single	0.443
Central system	76	Ceiling only	Single	0.454
In rooms	351	No insulation	Single	0.572
Central system	2	No insulation	Single	0.608

*Definition of Heat Factor, $F = \frac{\text{KWH} \times 1000}{\text{Cubic Feet} \times \text{Degree Days}}$

Where KWH = annual kilowatt hours as actually metered for space heating

V = volume of house in cubic feet

Dd = annual degree days

Records on many electrically heated houses were accumulated. Then by use of equation (1), the table of heat factors shown in Table 2 was developed. In the table we have marked lines 2 and 3 for special emphasis as the information there is representative of most of the house heating installations today—being in fairly well insulated houses with the heaters in the rooms rather than in central systems. The heat factor for line 2 is 0.277, and for line 3 is 0.296. This leads to the suggestion that we can generalize and use a heat factor of 0.3 in preparing most estimates.

The heat factor equation in another form is:

$$\text{KWH} = \frac{F \times V \times Dd}{1000}$$

$$\text{or KWH} = \frac{0.3 \times V \times Dd}{1000} \qquad (2)$$

In Table 3 this equation is shown as it would be used for various degree-day situations. As an example, for 5,000 degree days:

$$\text{KWH} = V \times 1.50$$

If V, or volume of house, is say 10,000 cu ft, then estimated energy consumption is 10,000 x 1.50 or 15,000 KWH per year.

It is just that simple. To obtain an estimate of the annual kilowatt hour requirements for space heating, multiply the volume of house by the appropriate factor from

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Table 3. Further refinement of the factor is possible by either interpolation, or by drawing a graph, factor versus degree days.

To determine the volume of the house, first secure the floor area according to the outside dimensions of the house. Then multiply the floor area by the inside ceiling height plus one foot. For the second floor, use the gross area of the second floor times the inside ceiling height plus one-half foot. Do not include the basement in determining house volume, even though the basement may indirectly receive some heat—say by radiation from floor above. However, if there is a basement bedroom or other basement space to be regularly heated, the net volume of such should be added to the house volume.

Rate of Heat Loss

In addition to the kilowatt hour requirements, the estimated rate of heat loss may also be derived from the heat factor. This is proved as follows for by definition:

$$\text{Annual load factor, LF} = \frac{\text{Annual energy for heating}}{\text{Maximum rate of heat loss x time}} \quad (3)$$

$$\text{Or} \qquad \text{LF} = \frac{\text{KWH}}{\text{KW x 365 days x 24 hours}} \quad (4)$$

where KW = maximum rate of heat loss in kilowatts. Annual energy for heating is proportional to annual degree days.

TABLE 3.—ENERGY EQUATIONS

Equation for annual kilowatt hours where heat factor equals 0.3 and V equals volume of house in cubic feet.

Annual Degree-Days	Annual Energy for Space Heating, KWH
500	KWH = V x 0.15
1000	V x 0.30
1500	V x 0.45
2000	V x 0.60
2500	V x 0.75
3000	V x 0.90
3500	V x 1.05
4000	V x 1.20
4500	V x 1.35
5000	V x 1.50
5500	V x 1.65
6000	V x 1.80
6500	V x 1.95
7000	V x 2.10
7500	V x 2.25
8000	V x 2.40
8500	V x 2.55

Maximum rate of heat loss is proportional to degrees temperature below 70F.

So from Equation (3):

$$\text{LF} = \frac{\text{Dd}}{(70 - \text{T}) \text{ x } 365 \text{ days}} \quad (5)$$

where T = design minimum temperature, F.

Now equate (4) and (5) and solve for KWH

$$\text{KWH} = \frac{24 \text{ x Dd x KW}}{(70 - \text{T})} \quad (6)$$

Now equate (2) and (6), and solve for KW

$$\text{KW} = \frac{\text{V x } (70 - \text{T})}{80{,}000}$$

$$\text{Or rate of heat loss, watts} = \frac{\text{V x } (70 - \text{T})}{80} \quad (7)$$

In Table 4, this equation is shown as it would be used for various design temperatures. For instance, at 10F outdoor temperature, the equation is:

$$\text{Rate of heat loss, watts} = \text{V x } 0.75$$

If V, or volume of house, is say 10,000 cu ft, then rate of heat loss is 10,000 x 0.75 or 7500 watts or 7.5 kw.

As regards space heating one should, of course, bear in mind that rate of heat loss, maximum demand, and connected load are three different quantities. But once having computed the rate of heat loss, the connected load can be determined.

Data Required

In summary, let us emphasize that the housheating estimator needs only:

1. Determine volume of house (house is to be reasonably well insulated, and heat is to be applied directly in the rooms).
2. Multiply the volume by appropriate factor from Table 3 to determine annual kilowatt hour consumption.
3. Multiply the volume by appropriate factor from Table 4 to determine rate of heat loss in watts.

TABLE 4.—RATE OF HEAT LOSS EQUATIONS

Equation for rate of heat loss in watts where heat factor equals 0.3 and V equals volume of house in cubic feet.

Design Temperature, F	Rate of Heat Loss from House, Watts
30	Watts = V x 0.50
25	V x 0.56
20	V x 0.63
15	V x 0.69
10	V x 0.75
5	V x 0.81
0	V x 0.87
— 5	V x 0.94
—10	V x 1.00
—15	V x 1.06
—20	V x 1.13
—25	V x 1.19
—30	V x 1.25

Centrifugal Pump Bearings

IGOR J. KARASSIK and ROY CARTER

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Mechanical arrangements and lubricating methods for centrifugal pump shaft bearings are discussed in this, the eighth in a series of articles on centrifugal pump components and characteristics.

CENTRIFUGAL pump bearings support the shaft or rotor in correct alignment in relation to the stationary parts under the action of radial and transverse loads. Those which give radial positioning to the rotor are called line bearings, whereas bearings which locate the rotor axially are called thrust bearings. Bearings which serve both as radial and thrust bearings are usually also called thrust bearings.

All types of bearings have been used for centrifugal pumps. Even the same basic design of pump is often made regularly with two or more types of bearings as required by varying service conditions, or by the preference of the purchaser.

For the double-suction, single-stage, general service pump, two external bearings, one on either side of the casing, are generally used. These were formerly of the babbitted type using oil lubrication, but in recent years most manufacturers have changed to anti-friction bearings using either grease or oil lubrication.

Some of the small, inexpensive centrifugal pumps used for pumping clear liquids are provided with an internal sleeve bearing, as shown on Fig. 1. The liquid itself is used as a lubricant, though a separate grease lubrication through an alemite fitting is used in some designs.

Pump bearings may be of the rigid or of the self-aligning type. A self-aligning bearing will automatically adjust itself to a change in the angular position of the shaft. In babbitted or sleeve type bearings the name is applied to bearings which have a spherical fit of the sleeve in the housing. In anti-friction bearings, it is applied to bearings in which the outer race is spherically ground or where the housing provides a spherical fit for the bearing.

The most common types of anti-friction bearings used on centrifugal pumps are the various types of ball bearings. Roller bearings are used to a lesser extent, but the spherical roller bearing is frequently used with large shaft sizes for which there is a limited choice of ball bearings. Most roller bearings are suitable only for radial loads, thus tending to limit their use on centrifugal pumps to applications which are not intended to carry a combined radial and thrust load.

Although double-suction pumps are theoretically in hydraulic balance, even such pumps are provided with thrust bearings, usually of the combined radial and thrust type. A centrifugal pump is a product of the foundry, and minor casting irregularities will always exist. These irregularities may cause differences in the eddy currents set up on the two sides of the impeller, resulting in an axial hydraulic thrust. In addition, unequal wear of the rings and other parts may cause unbalance. Finally, the flow of the liquid into the suction eyes may be unequal because of an improper suction piping arrangement, thus causing an unbalanced hydraulic condition. As a result, some form of thrust bearing, capable of taking thrust in either direction, is necessary for double suction pumps, in order to maintain the rotor in its proper axial position. Generally, the thrust capacity of such a bearing is far in excess of the probable unbalance due to irregularities.

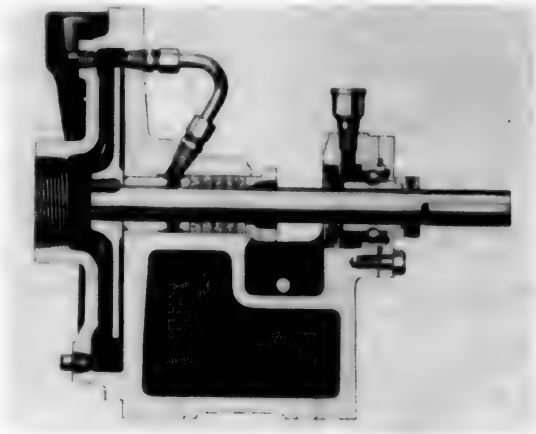

Fig. 1. Internal sleeve bearing.

Ball Bearings

The most common types of ball bearings used on centrifugal pumps are the single-row deep-groove type, the double-row deep-groove type, the double-row self-aligning type and the angular-contact type, made both in the single or double-row type. All except the double-row self-aligning type are capable of carrying thrust loads as well as radial loads. Sealed type ball bearings, adapter type ball bearings, and other modifications of ball bearings also have some application in special cases. It is important to remember that sealed pre-lubricated bearings require special attention if the unit in which they are installed is not operated for a long period of time—as, for instance, when kept in stock or storage. In such cases, the shaft should be turned over occasionally, say once every three or six months, to agitate the lubricant and maintain a film coating on the balls.

Bearings intended to carry thrust must be so mounted that both the inner and outer races are locked axially in position. The inner race is locked on the shaft, gen-

Fig. 2. Self-aligning double row ball bearing (SKF).

Fig. 3. Single row deep groove ball bearing (SKF).

Fig. 6. Double row angular contact ball bearing.

Fig. 7. Two single bearings mounted back-to-back.

crally between a shoulder and a shaft nut, while the outer race is locked between a shoulder in the bearing housing and the bearing cover bolted to the housing. On the other hand, so as not to transmit axial thrust loads to a bearing intended to carry radial loads only, the outer race must be permitted to undergo a slight axial displacement by sliding in the bearing housing, while the inner race is axially locked on the shaft. The outer race fit must not be too loose, however, so as to prevent rotation in the bearing housing.

The self-aligning type of ball bearing (Fig. 2) is the most serviceable type for heavy loads, high speeds, long bearing spans and no end thrust. For this reason, it is ideally adapted to service as a line bearing on a centrifugal pump. The double rows of balls run in fixed grooves in the inner or shaft race and the outer race is ground to a spherical seat. Any slight vibration or shaft deflection is therefore taken care of by this self-aligning bearing which operated as a pivot. In cases where lightly constructed pumps are used, "breathing" may take place in the casing when pressure is developed and this type of bearing is desirable, as the slight misalignment caused by "breathing" will be compensated in the bearing. It has very little thrust capacity and is not used for combined radial and thrust loads.

The single-row deep-groove ball bearing (Fig. 3) is most favored by bearing manufacturers because it is applicable to so many services and permits standardized production methods. It is capable of carrying both radial and axial loads and, for conservative speeds, low end thrusts and short spans, this bearing is very satisfactory. When two such bearings are used in a centrifugal pump, one of them is intended to carry both radial and axial loads, while the second carries radial loads only. Therefore, only one of the bearings must have both outer and inner races locked in position while the second bearing has its outer race free to displace axially.

The double-row deep-groove ball bearing (Fig. 4) is in effect two single row bearings side by side and has greater capacity both for radial and thrust loads. It is used quite generally when the loading is more than that permitted by the single row type.

The angular-contact ball bearing operates on a principle which makes it good for heavy thrust loads. The single-row type (Fig. 5) is good only for thrust in one direction, while the double-row type (Fig. 6), which is basically two single row bearings back to back, can therefore carry thrust in either direction. Two single-row angular contact bearings are frequently matched and the faces of the races ground by the bearing manufacturer for back to back mounting (Fig. 7) for two directional thrust loads. In some cases, the two bearings are locked together by recessing the inner races and pressing them onto a short ring. (See Fig. 8). When two separate angular-contact bearings are used, care must be taken to mount them correctly on the shaft.

Fig. 4. Double row deep groove ball bearing (SKF)

Fig. 5. Single row angular contact ball bearing.

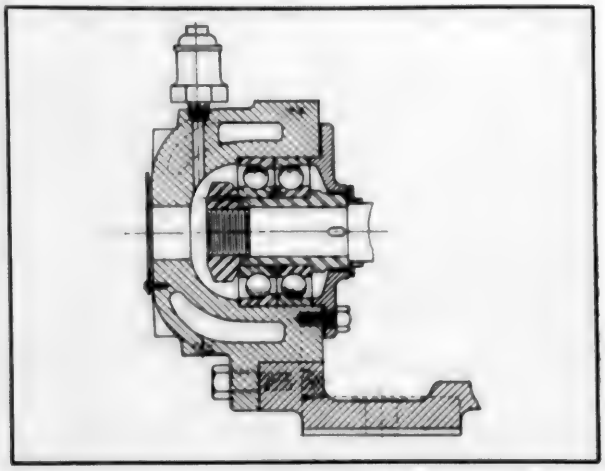

Fig. 8. Double row angular contact ball thrust bearing, grease lubricated and water cooled.

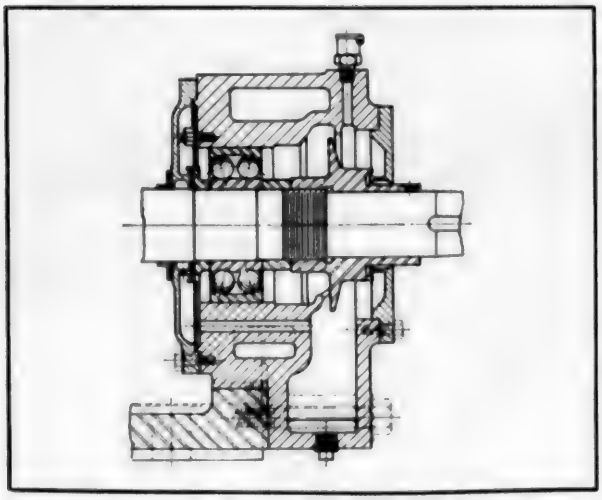

Fig. 9. Double row self-aligning line ball bearing, oil lubricated and water cooled.

The single-row angular-contact ball bearing can be used singly on centrifugal pumps only when there will be a thrust at all times in one direction. Hence, its field of possible application is limited primarily to vertical pumps.

The double-row bearing or its equivalent of a matched pair mounted back-to-back has been found very satisfactory where there is a possibility of a high thrust load in either direction. Some pump manufacturers standardize on this double-row angular-contact type for combined radial and thrust bearings.

Ball Bearing Lubrication

In the layout of a line of centrifugal pumps, the choice of the type of bearing lubricant is dictated by the application requirements, by cost considerations and, in certain cases, by the preferences of the type of purchaser which would absorb the major portion of the output of that line.

Ball bearings used in centrifugal pumps are generally grease lubricated, although for some types of services, oil lubrication is frequently applied. When bearings are grease lubricated, grease is packed into the bearing and the rotation of the balls throws it out of the bearing proper and creates a slight suction at the inner race. Even though the grade of grease used for the lubrication of ball bearings is relatively light, it is a semi-solid and flows slowly. As heat generates in the bearing, the flow of the grease is accelerated. This grease is then thrown out at the outer race by the rotation of the balls and is cooled by contact with the housing. There is, therefore, a continuous circulation of the grease which lubricates and cools the bearing. This method of lubrication requires the minimum amount of attention and has proved itself very satisfactory.

The housings of bearings of vertical pumps require seals to prevent the escape of the lubricant. Grease is generally preferred as there is less chance of leakage.

A grease lubricated ball bearing should never have its housing fully packed with grease, as it prevents the proper circulation of the grease. As a rough rule, it is recommended that the void spaces in the housing be $\frac{1}{3}$ filled with grease. An excess amount of grease will cause the bearing to heat and grease will flow out of the seals to relieve the situation. Unless the excess grease can escape through the seal or through a relief cock used on many large units, there is probability that the bearing will fail early. In general when the bearings are grease lubricated, there is more trouble caused by an excess of lubrication than by lack of lubrication. Thus, here is the exceptional case where too much attention is worse than two little.

When ball bearings are oil lubricated, it is necessary to provide an adequate method for maintaining suitable oil levels in the housing. The level of the oil should be at about the center of the lowermost ball in the bearing when the latter is stationary. This may be accomplished by a dam to keep the oil level just right (see Fig. 9) and an oil slinger to maintain the level behind the dam and so increase the leeway in the level at which the operator must keep the oil in the housing. In some cases, oil rings are used to supply oil to the bearings from the bearing housing reservoir as shown on Fig. 10. In other designs, a constant level oiler (Fig. 11) is used to maintain the proper oil level in the bearing housing.

Sleeve Bearings

While antifriction bearings have replaced the plain cylindrical journal or sleeve bearing in the majority of centrifrugal pump designs, there still remains a large field of application for this type of bearing. At the one extreme of this field of application, the sleeve bearing is used for reasons of economy because it leads to a cheaper construction. Some of the small inexpensive centrifugal pumps used strictly for pumping clear liquids are pro-

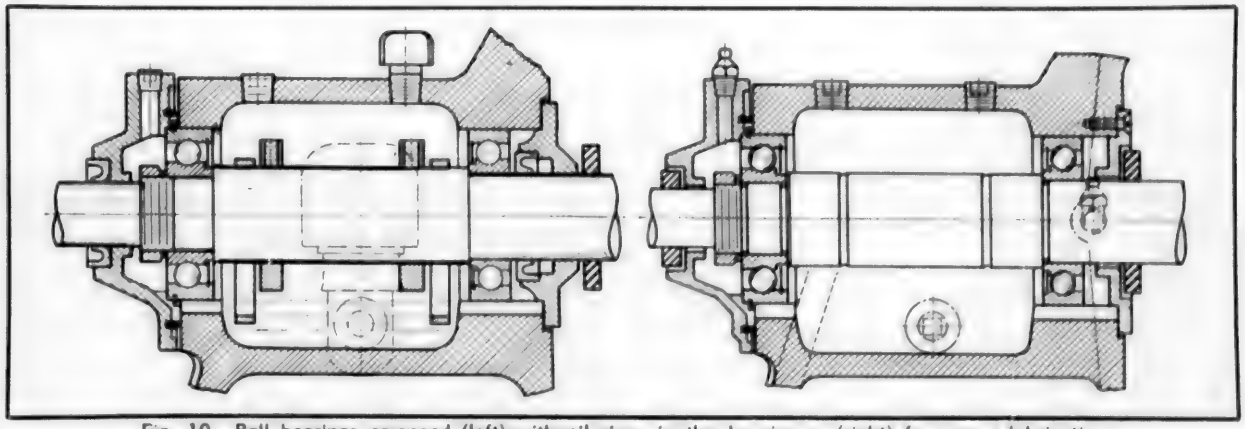

Fig. 10. Ball bearings arranged (left) with oil rings in the housing or (right) for grease lubrication.

vided with an internal sleeve bearing, as illustrated on Fig. 1. This type of internal sleeve bearing depends primarily on the liquid pumped for its lubrication and a water seal is sometimes used in the center of the bearing, connected to the pump discharge whence liquid is introduced under pressure.

At the other extreme of the field, sleeve bearings are used for heavy duty pumps, when the shaft diameter reaches proportions such that antifriction bearings are not available or may be considered less reliable at the operating speeds involved. Such is, for instance, the case with high pressure boiler feed pumps designed for pressures of 1500 psi and above, operating at speeds of 3600 rpm and having shaft diameters of over 3 inches at the bearings.

In addition, there are sometimes encountered personal preferences for the use of sleeve bearings, preferences strong enough to warrant some pump purchasers to pay a premium, if necessary, for special design modifications to standard pumps which are then built with sleeve bearings instead of the usual ball bearing construction.

The materials used for the bearing bushings vary considerably between various designs, but for heavy duty service, babbitted bearings are generally preferred. The bearing bushing may consist of a babbitt lining of ⅛-inch thickness or over, anchored in the bearing shell by means of dovetailed grooves. For better results, the cast iron shells are first tinned and the babbitt poured at the melting point of tin in order to insure a perfect bond.

The simplest form of sleeve type bearings used to carry a thrust component, incorporate a babbitted shoulder in the bearing shell, a collar or shoulder being provided on the shaft to ride against this babbitted shoulder and lubrication being supplied under pressure at that point. For more severe services, the usual solution is to supply a regular Kingsbury type of thrust bearing. Kingsbury bearings are capable of taking care of unit thrust loads and high linear speed so far in excess of the ordinary straight collar thrust that there is no near comparision between the two. Their cost is relatively high, however, and therefore, their use, except where extreme thrust conditions are present, may not always be warranted.

Mechanical Features of Bearing Construction

Bearing Location. On horizontal pumps that have a bearing at each end, the bearing at the outboard end is known as the outboard bearing and the bearing at the driver end, the inboard bearing. Pumps with overhung impellers have both bearings on the same side of the impeller. On these, the bearing nearest the impeller is the inboard and the one farthest away is the outboard. Generally when a pump is provided with bearings at both ends, the thrust bearing is placed at its outboard end and the line bearing at the inboard end.

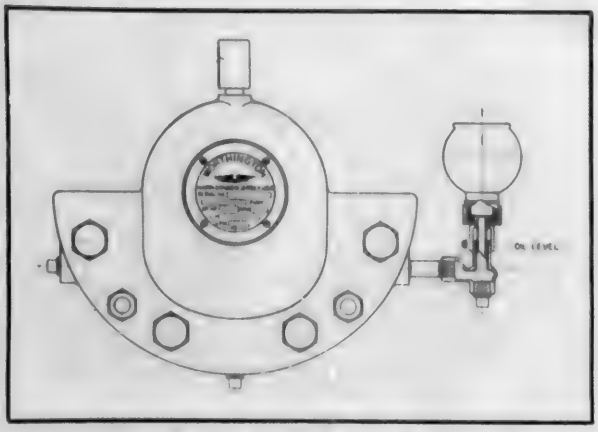

Fig. 11. Constant level oiler.

Water Cooling. There is a certain amount of friction in every bearing, even in the anti-friction type. As a result, every bearing when in operation generates heat, the amount of which depends upon the load on the bearing and the rotative speed. The heat, so generated, must be dissipated either to the surrounding air, or through some other medium. If the amount of heat generated is too much for air cooling, water cooling becomes necessary. Thus, thrust bearings are more frequently water cooled than line bearings. This can be accomplished either by circulating water (or other cooling liquid) through a jacket surrounding the bearing.

With pumps handling hot liquids, heat from the interior of the pump may be transmitted to the bearing housings and the bearings by radiation and by conduction along the shaft, thus adding to the problem. There are a few installations where pump bearings are cooled with air forced through ducts in the bearing housings by fans.

Bearing Housings. The bearing housing is the part which houses the bearing and locates it in its correct radial position, concentrically with all the bored fits which form the pump running joints. The bearing housing fulfills the function of containing the lubricant necessary to the proper operation of the bearing. With thrust bearings, the housing also has the function of locating the bearing in its proper axial position.

Bearing Brackets. The structural element used to support and connect the bearing housing to the pump is called the bearing bracket. It can be a separate piece or part of either the bearing housing or the pump casing or head.

If the bearing bracket of a pump is cast onto the pump casing, it is called an integral bearing bracket. If the bracket is bored and otherwise machined at the same time as the casing is bored, correct alignment is assured. The bracket is usually designed so it acts as a pocket to collect the leakage from the stuffing box.

Pedestal Type Bearings. A pedestal type bearing is one in which the housing is supported on a flat surface, generally a pad on a bedplate or a sole plate. It is most advantageously used for radial loads. It was used quite extensively for centrifugal pumps in their early stages of development but has been generally superseded by the bracket type bearing, first because of easier alignment and, second, because of increased thrust loads resulting from higher head application. The pedestal type bearing is still used in connection with centrifugal pumps for supporting a separate jackshaft or an extension of the pump shaft for belt drive, for some belt drive pump designs, and in some large pump designs.

Next month—Centrifugal Pump Couplings

AIR CONDITIONING HEATING and VENTILATING'S

Reference Section

BASIC PRINCIPLES OF PNEUMATIC CONTROL MECHANISMS

WERNER G. HOLZBOCK

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Basic Principles of Pneumatic Control Mechanisms

WERNER G. HOLZBOCK

The action of basic mechanisms in pneumatic controlling devices for regulation of temperature, pressure, and flow is described. Refinements in instrument design and the application of feedback principles are illustrated.

THE progress which heating and air conditioning have made during the last twenty years is due, in large part, to perfection of the means of measurement and control of variables, such as temperature, pressure, and flow. Refinements in controlling devices have allowed faster and more precise measurement and continually improved methods of response to variations from a predetermined setpoint.

Response consists of introducing certain changes in the system under control, frequently by automatically positioning a control valve, thus compensating for the deviation which the measuring element has detected in the controlled variable.

For example, the temperature of a liquid which is heated by steam is measured, and in accordance with the measurement the steam admitted to the heating device is automatically adjusted to exactly the flow rate that is required to keep the temperature at its desired value, i.e. at its setpoint.

From Measurement to Control Valve

The control valve is generally air actuated. The air pressure is applied to one side of a large diaphragm of 50 to 200 square inches of area. The other side of this diaphragm is fastened to a valve stem. The air pressure tries to move the valve stem downwards against an upward force exerted by a helical spring, as shown in Fig. 1. By increasing and decreasing the air pressure on top of the diaphragm, it is possible to position the valve to any desired opening.

The usual arrangement is such that air pressure changes of from 3 to 15 psig move the valve through its full stroke.

To incorporate the control valve into an automatic process, it is necessary to convert the measurement of the variable, temperature in the above example, into an air pressure signal transmitted to the valve.

The ideal case is that in which the control valve air pressure is 9 psig, i.e. midway between 3 and 15 psig, when the temperature is at the setpoint, and to increase or decrease the pressure in exact proportion to any deviation from this point. A controller which responds in such a way is a proportional controller.

Such an operation assumes that the valve opening which corresponds to 9 psig air pressure is precisely that which furnishes enough steam to maintain the setpoint of the liquid. This might well be true for a given instance; but suppose the liquid is in continuous flow, and while it passes through a vessel it is being heated. It might happen that the incoming liquid changes in temperature, let us say the temperature drops, which means that more steam is required to bring the liquid up to the same temperature as before.

How does the control loop respond to this new condition?

The first reaction will be that the measured temperature decreases and the control valve air pressure will consequently drop to say 7 psig. This opens the valve wider and more steam is admitted to the heating equipment. This is exactly what is wanted and the temperature moves towards the setpoint again. However, in the measure as it approaches the setpoint, the air pressure increases, since temperature and control valve air pressure are in an inalterable relationship. As the pressure increases, the valve throttles the steam flow—an action which defeats the intent of obtaining a permanent increase of steam flow as demanded by the new process condition. Thus the controlling arrangement under consideration is not able to bring the temperature back to the desired level. A deviation from the setpoint will persist. This deviation is called offset.

Offset is due to a so-called load change, a name which is applied to a change in the process that requires a permanent increase or decrease of the air pressure to keep the valve in a position which corresponds to the new condition.

If it would be possible to change the relationship between measurement and control valve air pressure in

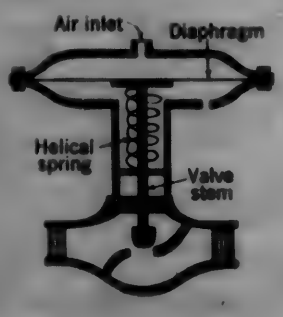


Fig. 1. Control valve.

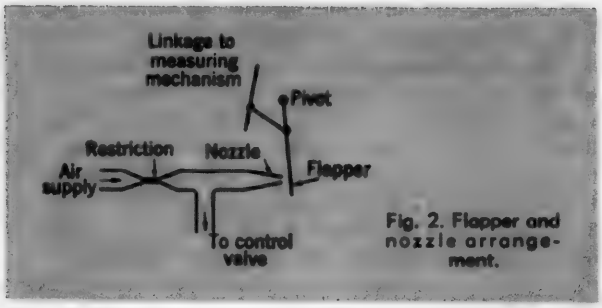


Fig. 2. Flapper and nozzle arrangement.

such a way that the setpoint no longer corresponds to 9 psig but to, let us say, 8 psig, then the offset would be compensated for by additional valve opening and the process could be kept at the same temperature as before.

This change of relationship is possible in modern control instruments. It takes place when the arrangement is unable to reestablish the desired temperature level, and is called automatic reset.

An accurate measuring device is usually a delicate device. Making it work means burdening the mechanism, and this is likely to introduce inaccuracies. In the design of a controller, every effort is made, therefore, to convert weak inputs into forceful signals and to demand only a minimum amount of work from the different mechanisms which are involved.

The Flapper-and-Nozzle Principle

A basic mechanism in pneumatic controllers consists of a flapper and a nozzle illustrated in Fig. 2. If the restriction is smaller in cross-sectional area than the area of the nozzle opening, and the flapper leaves the nozzle entirely open, then the pressure between restriction and control will be equal to atmospheric pressure plus the pressure drop across the nozzle opening. On the other hand, when the nozzle is completely closed by the flapper the pressure between restriction and control valve, i.e., the nozzle back pressure will build up to the pressure of the air supply.

Between these two extreme conditions, fully open and fully closed, the flapper might assume any number of positions: the closer it moves towards the nozzle the higher becomes the nozzle back pressure.

By means of a suitable linkage, the flapper is connected to the measuring mechanism and positioned by it. This arrangement might look like putting a heavy load on the measuring mechanism which is expected to operate the flapper and, in one position, to close the nozzle completely against an air pressure of 15 psig. In reality, the load is a very light one. The maximum push the air will exert on the flapper in a standard design is about 0.00285 lb or 0.0356 oz or just about one gram. This is made possible by a nozzle opening which has a diameter of 1/64 of an inch. Since this corresponds to an area of the nozzle opening of 0.00019 square inch, the resulting force caused by an air pressure of 15 psig is $0.00019 \times 15 = 0.00285$ lb.

It was stated above that the cross-sectional area of the restriction must be smaller than the nozzle area. Thus the nozzle of 1/64 of an inch of diameter requires a restriction diameter of about 0.008 inch. The really amazing thing is that with all these minute dimensions, with a maximum force of one gram the steam flow to some gigantic piece of machinery may be controlled, and a temperature may be kept steady within one degree or less.

It is of interest to consider the amount the flapper has to move in order to bring the control valve from, say, a completely closed to a completely open position. The flapper at the point of nozzle contact moves in this case through a distance of the order of two thousands of an inch. This is the total travel required to move the flapper from a position in which it covers the nozzle completely increasing the nozzle back pressure to 15 psig, to one in which enough air escapes through the nozzle to drop the back pressure to its minimum value.

On the basis of this small movement, the total work to be done by the measuring element is on the order of 0.000 000 2 ft-lb.

Pilot Valves

One of the continuous concerns in controlling processes is speed. Once a deviation is sensed by the measuring element, corrective action must be taken quickly. If the control valve air pressure, for example, is to be increased and all the air necessary for this action has to pass through the restriction, then a definite delay will take place in the control valve action.

There is a considerable air volume required in filling up the air tubing to the valve and the space above the diaphragm, and to produce a change of control valve air pressure requires the release or the addition of a relatively large amount of air. This air would have to pass either through the small nozzle, when it is released, or it must pass through the even smaller restriction, when pressure is to be increased.

To reduce these delays, pilot valves are provided. Basically, they are nothing but small three-way air valves inserted between nozzle and control valve. They require small air volumes for their operation but they are able to rapidly release from or admit to the control valves relatively large volumes of air.

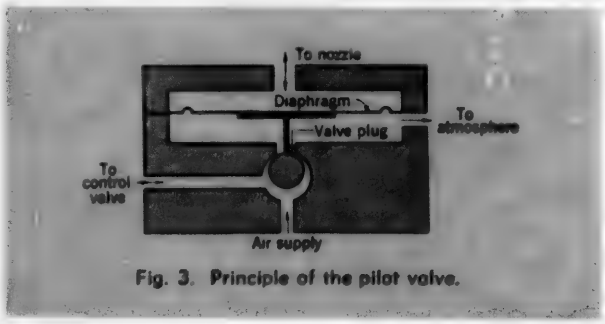


Fig. 3. Principle of the pilot valve.

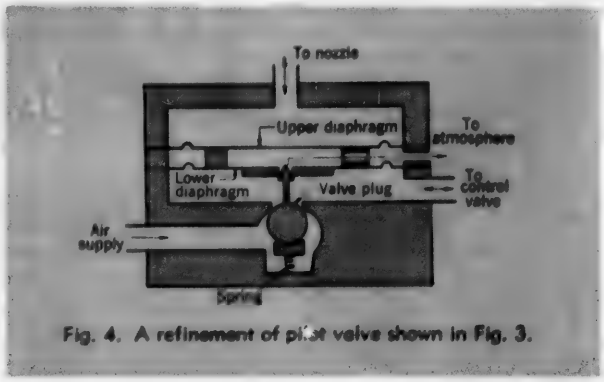


Fig. 4. A refinement of pilot valve shown in Fig. 3.

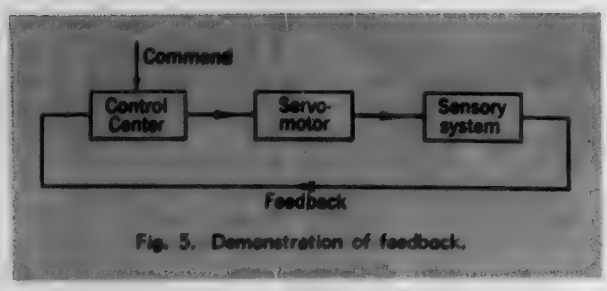


Fig. 5. Demonstration of feedback.

The principle of one type of pilot valve is shown in Fig. 3. The spherical valve plug is connected to the diaphragm by means of a valve stem. In the illustrated position the exit, which connects to the atmosphere, is closed by the plug and the undiminished air supply pressure is applied to the control valve. In this position, the nozzle, to which this pilot valve would be connected, would obviously be wide open since the diaphragm in the pilot valve is not deflected at all. Should the nozzle back pressure increase because the flapper moves closer towards the nozzle, the diaphragm would deflect and the valve plug would, at least partially, open the port to atmosphere and close by a corresponding amount the port that admits air from the supply line. The maximum deflection of the pilot valve diaphragm would block off the air supply and release all excess air in the control valve to reduce the control valve air pressure to atmospheric condition. All intermediate positions of the pilot valve diaphragm produce intermediate control valve air pressures.

Thus, the nozzle-and-flapper arrangement fulfill their control function as before. However, the air to the control valve has no longer to pass through the restriction, and the air from the control valve is no longer released through the nozzle. This air flow is now regulated by the pilot valve which has far more generous dimensions as far as air passages are concerned. Consequently, the action of the control valve is considerably accelerated.

There is another advantage in a pilot valve. To evaluate this advantage it is necessary to consider the role of linearity. The movement of the flapper can be expected to be linear with the response of the measuring mechanism. The change of nozzle back pressure, however, is basically non-linear in relation to the flapper movement. Only within very small limits of flapper movement can linearity be approached and the aim of the designer is consequently to reduce this movement wherever he can. With reference to Fig. 3, it is conceivable, and is actually being done, to move the pilot valve through its full stroke, and hence also the control valve, by changing the nozzle back pressure on top of the pilot valve diaphragm through, say, 3 psi. Thus an amplification takes place: the 3 psi change in nozzle back pressure produces a 12 psi change in control valve air pressure. This allows controlling with an even lesser flapper movement than would be possible without the pilot valve. The result is an increase of linearity in the controller.

Fig. 4 illustrates a refinement of the principle shown in Fig. 3. The mechanism in Fig. 4 might seem more complex but the resultant characteristics differ from the previous ones in two important points. One is that no continuous air loss is involved. In Fig. 3, the bleeding of air to the atmosphere is continuous except when the maximum air pressure is applied to the control valve. In Fig. 4, loss of air occurs only temporarily when some of the control valve air pressure has to be released.

The other difference is that in Fig. 3 for any condition which does not require full air pressure to the control valve, the diaphragm will be deflected to a lesser or larger degree. The need for linearity in the relation between flapper movement and nozzle back pressure has been mentioned. It is just as much a requirement that the deflection of the pilot valve diaphragm as well as the characteristics of the valve plug be such that linearity is maintained. In Fig. 4, in spite of apparently greater complexity, these factors are no longer as critical as in Fig. 3. This is due to the force-balance principal which is of great importance because it recurs continuously in pneumatic controllers.

In Fig. 3, the condition shown is that which exists when full air pressure is applied to the control valve. Any other condition results in a certain amount of deflection in the diaphragm and a correspondingly changed position of the valve plug. Things are different in Fig. 4. Here, the condition shown might correspond to any control valve air pressure. The two diaphragms which are connected to each other so that they move in unison, will always return to the position shown, once they have provided a necessary correction in the control valve air pressure.

How is such action obtained?

Suppose the nozzle back pressure increases due to the flapper approaching the nozzle. This will deflect the upper diaphragm of the pilot valve and with it the lower diaphragm. It is assumed that the force of the coiled spring which pushes against the valve plug is negligible, but it might be added that it is one of the problems in designing such a pilot valve to attain a negligible spring pressure with the assurance of positive shut-off of the valve. It is further assumed that no amplification of the change in nozzle back pressure takes place in the pilot valve, although all that would be required for this purpose is a lower diaphragm of smaller area than the upper one has.

As the diaphragm arrangement moves downwards, the valve plug is also pushed down. The action results in an opening of the valve port and admission of supply air to the control valve. The control valve air pressure which is now rising pushes against the lower diaphragm. Once the control valve air pressure has increased sufficiently to equal the nozzle back pressure applied to the upper diaphragm, the forces across the diaphragms are in balance, the valve is closed again, and all conditions are the same as shown in Fig. 4, but the control valve air pressure is now at a higher value. Non-linearity in the diaphragm response and in the characteristic of the pilot valve would not influence the action.

In case the nozzle back pressure should decrease, the diaphragm would deflect upwards. This would open the

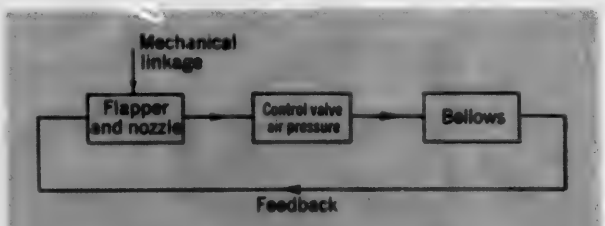


Fig. 6. Feedback applied to control.

outlet port to atmosphere and the control valve air line would release air through this port until the force balance across the diaphragms is reestablished and the outlet port to atmosphere is again closed.

Feedback

Returning now to the flapper-and-nozzle system of Fig. 2, this system although workable and widely used has shortcomings that would seriously affect many control systems.

It was stated that the movement of the flapper is in the order of two thousandths of an inch. It must be furthermore considered that within this minute movement the flapper has to assume an infinite number of positions within which it is expected to maintain an accurate relationship to the measurement mechanism. If this relationship is to be accurate within 0.1%, then the flapper is to be positioned within two millionth of an inch with unfailing precision. Considering mechanical linkages and the lost motion, friction, and backlash that are unavoidable parts of them, this accuracy appears to be impossible.

The method by which such delicate positioning mechanism are made possible is that of feedback. Long before the term feedback was known, instrument engineers used the principle extensively. Once it became a recognized phenomenon in electronic circuits, th mathematical relations were established and the feedback principle was found to be of such general validity that it was applied to biology, sociology, and other sciences.

A favorite example for demonstrating feedback is the action that takes place in picking up an object from a table. Let the action start with a command to the brain, and the brain be called a control center. This control center causes the body to go through certain motor actions. In Fig. 5 the seat of these motoric actions is called a servomotor.

The resulting movement towards the object on the table is reflected in the sensory system which feeds back to the control center the progress. The control center in response to this feedback signal modifies its output in accordance with the progress of the hand towards the object.

Why Feedback?

It is conceivable that the control center would merely signal to the servomotor the required action which would then take place with the necessary precision and nothing more would be necessary. But the precision required would be much greater, since the possibility of correction is left out. There is a certain parallel between the reasons for feedback and those that led to the pilot valve principle of Fig. 4: In both cases, the device is expanded in order to correct for non-ideal conditions inherent in this device thereby obtaining the highest degree of perfection possible.

In order to apply the feedback principle to the flapper-and-nozzle action, the block diagram of Fig. 5 is modified into that of Fig. 6. The command which was shown in Fig. 5 entering the control center is now supplanted by the mechanical linkage which assumes a certain position dictated from the measuring mechanism and thereby initiates the action.

The control center is replaced by the flapper-and-nozzle system, and the motion which in Fig. 5 is caused by a servomotor is now obtained by the control valve air pressure. A bellows which is described subsequently, substitutes the sensory system.

Fig. 7 illustrates the physical arrangement which corresponds to the block diagram of Fig. 6. The feedback action that the bellows exerts upon the flapper can be seen.

In Fig. 2, the flapper turned around a fixed pivot. This is now different. In Fig. 7 the linkage to the measuring mechanism is free to rotate the flapper using as a pivot the connection *B* which ties the flapper to the bellows rod. On the other hand, contraction and expansion of the bellows will also move the flapper, using *A* as a pivot.

It should be remembered that the illustration is highly schematic and does not consider the case where the measuring mechanism pulls the flapper towards the left after it closes the nozzle. This would produce an undue load in the measuring mechanism and to prevent it, the designer would provide an overthrow feature.

Suppose a change in the measured variable moves the flapper towards the nozzle. This increases the nozzle back pressure, repositioning the control valve accordingly. Simultaneously, the feedback bellows responds to the increased air pressures and pushes the flapper at *B* to the right. This uncovers the nozzle by a corresponding amount and decreases the nozzle back pressure.

Thus, there are two opposite actions positioning the flapper, one coming from the measuring mechanism, the other due to the feedback bellows. If the feedback were to completely cancel the movement caused by the measuring mechanism, the nozzle back pressure would drop to its initial value. This would move the bellows towards the left, the flapper would move towards the nozzle, the pressure would rise, the bellows would move towards the right, and so on. The result is a pulsating control valve, an unstable condition.

If the feedback is less than the initial effect caused by the measuring mechanism, there might also be some pulsation, which, however, will be rapidly subdued. The action is as follows: The nozzle back pressure increases; then, due to the action of the bellows, it diminishes somewhat; this reduces the magnitude of feedback; and so on. In other words, a final and steady position is obtained after a few rapidly subsiding oscillations.

Similar to the movement of the hand which picks up an object from the table and the corrective action which is provided by the feedback from the sensory system, a continuous correction is provided by the feedback from

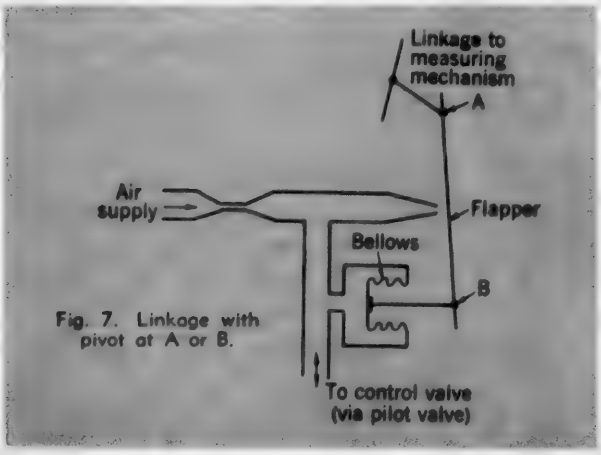


Fig. 7. Linkage with pivot at A or B.

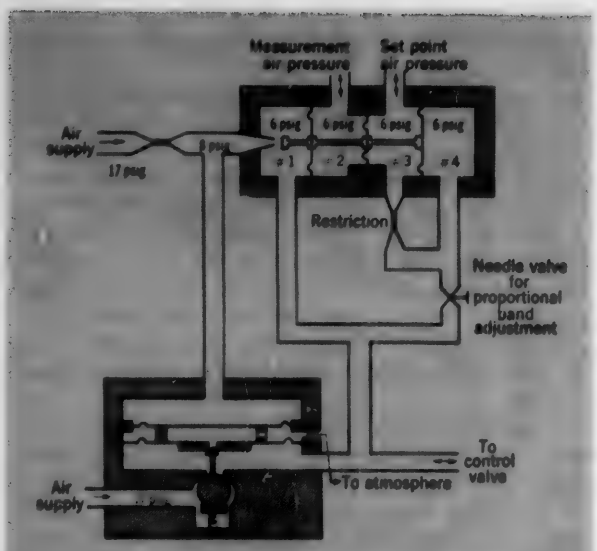


Fig. 8. Schematic of force-balance control.

the bellows to the flapper-and-nozzle system. The amount of initial flapper movement caused by the measuring mechanism can be relatively large, the feedback bellows will provide a precise final adjustment. By the same token, the movement of the hand might initially swerve considerably from a direct route to the object, the sensory system will cause the necessary correction.

It is obvious that the magnitude of feedback action can be determined in the initial design. It can also be made adjustable. If, for example, *B* could be shifted up and down along the flapper, in an arrangement that will be shown, the amount of feedback could be adjusted for any desired magnitude.

This allows a change in the effect on the nozzle back pressure as caused by the measuring mechanism. It determines how much change in coltrol valve air pressure is to be caused by a given change in the measured variable. This proportional relationship is the proportional band of a controller. It is adjustable by changing the amount of feedback.

Force-Balance System

It is of interest to compare Fig. 4 and 7. The two mechanisms serve different purposes, it is true; but they are similar in that both have an air output, the pressure of which is proportional to some form of an input. In Fig. 4 two forces act upon each other, and the resulting balance determines the output pressure. It is difficult to conceive unstable, fluctuating conditions in this arrangement. The positioning of the flapper in Fig. 7 occurs by two forces which also seek a balance but which are not directly applied against each other. The resulting mechanism is a more delicate one, and the question arises as to whether the more rugged force-balance principle of Fig. 4 might not be applied for the control action illustrated in Fig. 7.

The input signal of Fig. 7 is due to some measuring mechanism. The measurement signal is converted into a movement of the mechanical linkage. The arrangement of Fig. 4 requires air pressure as an input signal. It now appears that many measurements can be directly converted into an air pressure.

Flow

The most common method to measure rate of flow is to place an obstruction in the pipe line, and to measure the pressure difference across the obstruction. This pressure difference is an indication of the rate of flow. It is obvious that a diaphragm can be used to measure the pressure difference by applying the high and low pressures respectively to both sides of the diaphragm. The diaphragm movement in turn can be linked to a valve stem which regulates an air output. This air output is then proportional to pressure difference and hence an expression of the rate of flow. By such methods and similar ones, it is possible to express measurements of a large number of process variables in terms of air pressure.

Obtaining an air pressure signal for the measurement, the first thing that can be done, is to compare it with another air pressure which is called setpoint pressure. The setpoint pressure is manually adjustable by means of a pressure regulator which means that once it is adjusted it will keep the pressure constant at that value.

As long as measurement pressure and setpoint pressure are in balance there will be no control action. It is thus possible by manually shifting the setpoint pressure to increase or decrease the level at which control action takes place and change, say, a temperature from 120 to 140 deg F.

Fig. 8 shows schematically the arrangement of a force-balance controller. The pilot valve of Fig. 4 has now undergone some modification. The area of the upper diaphragm has been decreased. Since force is the pressure multiplied by the area upon which it is applied, it results that the smaller area of the upper diaphragm requires a larger pressure than the lower diaphragh in order to obtain a balance of the forces across the two-diaphragm assembly. Let us assume that an excess of 2 psi nozzle back pressure will suffice to balance the control valve air pressure. This would mean that the balanced pilot valve will always maintain the 2 psi pressure difference between control valve air pressure and nozzle back pressure.

The nozzle which in all previous arrangements released the air directly into the atmosphere, is now, as shown in Fig. 8, bleeding into a chamber which is directly connected into the control valve air pressure.

The result is that under balanced conditions, the ports of the pilot valve are no longer closed but the port to the atmosphere will be open to release the air that bleeds through the nozzle and which, if not released, would increase the control valve air pressure. Since the pilot valve is built for that pressure difference of 2 psi, it will automatically provide the necessary opening of the port.

Compared with previous arrangements, the flapper in Fig. 8 is hardly recognizable. It is now a rigid stem, connected to three diaphragms, and when any one of these diaphragms deflects, the whole stack including the flapper is bound to move. There are four chambers, and for easier reference they have been numbered 1 to 4.

Suppose an initial condition in which the needle valve for proportional band adjustment is closed and air pressures are distributed as indicated in Fig. 8. Starting with these conditions, let the measurement in No. 2 chamber

increase from 6 to 8 psig. Since the area of the diaphragm between 1 and 2 is larger than between 2 and 3, the increased air pressure will exert a force towards the left and the flapper will move towards the nozzle. The nozzle back pressure will increase and, consequently, the pilot valve will act to admit more air pressure to the control valve.

The increase of control valve air pressure is fed back into No. 1 chamber. When the control valve air pressure reaches the new value of the measurement air pressure, i.e. 8 psig, the forces across the controller diaphragms are balanced again. The flapper returns to its initial position. Since the control valve air pressure increased to 8 psig, the nozzle back pressure, maintaining the 2 psi pressure differential, will likewise increase to 10 psig.

The proportion between changes in measurement air pressure and control valve air pressure would be 1:1, both changing by the same amount. In order to obtain, say, twice the response in the control valve air pressure for a given increase (or decrease) in the measurement air pressure, the needle valve for proportional band is slightly opened.

This changes the behavior of the controller because the feedback, which is directly applied to the No. 1 chamber, is also active in the No. 4 chamber, although less there since the needle valve reduces its effect.

As air flows through the needle valve, increasing the pressure in the No. 4 chamber, air also flows from 4 to 3 through the restriction shown. This will not increase the pressure in No. 3, since the setpoint pressure is controlled by a regulator, which once it is set, will keep the pressure constant. The result is that the pressure in No. 4 is maintained between the control valve air pressure and the setpoint pressure. Once these two pressures are given, pressure in No. 4 depends on the amount of opening of the needle valve. Thus, there is a pressure difference between 1 and 4.

Let it be assumed that the needle valve is positioned so that the increase from 6 to 8 psig in the control valve air pressure will raise the pressure in the No. 4 chamber to 7 psig. The pressure in No. 1 will now have to increase to 9 psig to balance the system as follows: No. 1 chamber at 9 psig, No. 2 at 8 psig, No. 3 at 6 psig, and No. 4 at 7 psig. The diaphragm between 1 and 2 is exposed to a pressure difference of 1 psi towards the right. The same difference exists also at the diaphragm between 3 and 4, only in the opposite direction. The result is a balanced condition.

However, the complete story is somewhat more involved than that. The increase in control valve air pressure to 9 psig will also produce a pressure increase in No. 4, but the effect is greatly reduced as compared with the initial response and continues decaying in such a manner that after a few rapidly subsiding oscillations, the system will settle down to a new value. This last action is very similar to the one described in connection with Fig. 7.

Automatic Reset

Automatic reset was mentioned when the chain of events from measurement to control valve was investigated. It was found that in the example of a steam-heated process, the proportional controller would not be able to provide a sufficiently increased valve opening when this became necessary to keep the process at the desired temperature. Automatic reset was mentioned as the means to overcome this shortcoming. It is illustrated in Fig. 9. The arrangement shown in this illustration starts out from Fig. 7, but a second bellows, the reset bellows, is added on the right-hand side. This reset bellows is connected to the nozzle back pressure. What is its effect?

When the measuring mechanism moves the flapper towards the left, the nozzle back pressure increases and the feedback bellows on the left pushes the flapper away from the nozzle by a certain amount. The net effect remains an increase in nozzle back pressure which is determined by the proportional band. The control valve moves to a new position.

The increased nozzle back pressure produces an air flow through the needle valve into the reset bellows. This will gradually move the flapper back towards the nozzle and further increase the back pressure and, hence, produce an additional movement in the control valve.

This action will continue until the maximum nozzle back pressure is reached. It is, however, a gradual action and can arbitrarily be delayed by adjusting the needle valve accordingly.

The controller action, so far, consists thus in an initial action as proportional controller only causing a limited increase in nozzle back pressure. This increase continues gradually because of the reset action of the right-hand bellows.

Referring back to the example of a process temperature maintained by the automatic control of steam flow to a vessel, the purpose of the controller action is to respond to a deviation of the temperature from the setpoint. When the temperature increases, the control valve moves to reduce the steam flow. Automatic reset has the effect of throttling the control valve more and more and the temperature is bound to drop finally. This change will be sensed by the measuring mechanism which will move the flapper away from the nozzle, thus decreasing the pressure.

There is a very subtle shifting of forces going on. As long as there is any difference in pressure between the two bellows, the reset action will continue. If, for ex-

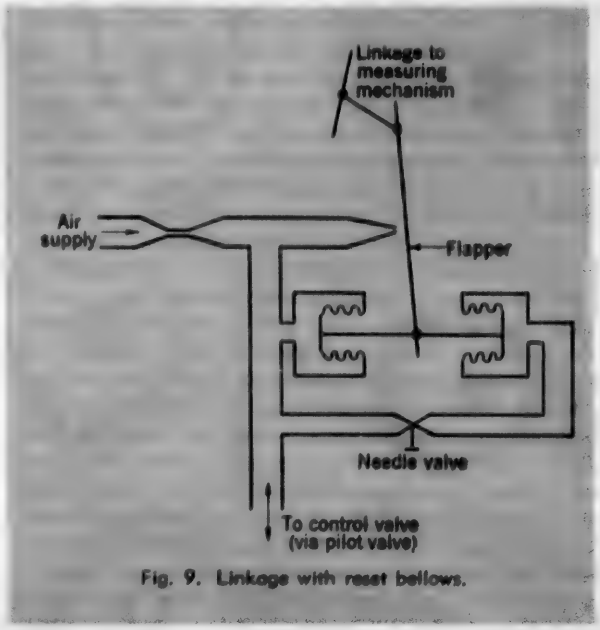


Fig. 9. Linkage with reset bellows.

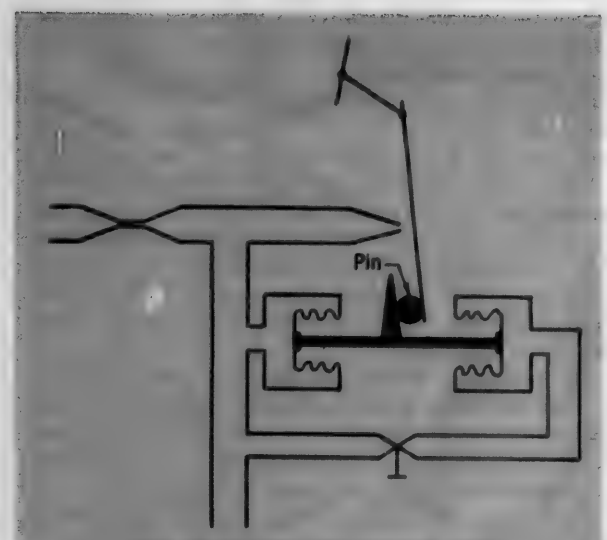


Fig. 10. Linkage with moveable pivot.

ample, the measuring mechanism in combination with the feedback bellows produces a back pressure lower than that in the reset bellows, then the reset action is reversed, and little by little its effects will lower the back pressure. Thus, a continuously floating action may be obtained. But it is also possible that the system comes to rest provided the pressure in the feedback bellows becomes equal to that in the reset bellows.

It is generally possible to adjust the automatic reset by means of the needle valve and the proportional band to values which allow to obtain the required balance with a minimum of oscillations. This requires adjustment not only of the reset action but also of the proportional band.

Fig. 10 shows how adjustment of the proportional band can be obtained in principle. The illustration differs from Fig. 9 only in the mechanical linkage between bellows movement and flapper. In Fig. 9, the horizontal rod connecting the two bellows is directly linked to the flapper. In Fig. 10, however, a pin transfers the movement of the rod to the flapper. This pin can be moved up and down and fixed for any intermediate position. The further up the pin is located, the more pronounced will be the effect of the bellows movement on the flapper. This means that in the upper positions a response of the measuring mechanism to a change in the measured variable will have a relatively large effect on the control valve air pressure. Hence, the proportional band will be narrow. It can be widened by lowering the pin.

How is automatic reset obtained in a force-balance controller such as shown in Fig. 8? Suppose the restriction which is shown in that illustration between the No. 4 and No. 3 chambers would be completely closed. The pressure in the No. 4 chamber would then gradually build up to the same pressure which exists in the No. 1 chamber. The effect would be the same as that between feedback and reset bellows in Fig. 9 and 10, and the needle valve would then change the magnitude of automatic reset rather than change the proportional band. Actually, a much smaller reset valve would be required for reset than for proportional band to obtain the desired delay in the reset action. If no adjustable band is required, the arrangement could be used, but where adjustability becomes a necessity, things grow more complex.

The principle of a force-balance system with adjustable band and automatic reset is shown in Fig. 11. The similarity to Fig. 8 is obvious. The connection between No. 3 and No. 4 chambers is, however, taken out. To be able to maintain the feedback pressure in No. 4, a second nozzle is added. Chamber No. 4 connects through a restriction to nozzle No. 2.

The back pressure in the No. 2 nozzle under otherwise static conditions is controlled by a flapper rigidly connected to a diaphragm. Air which flows through the needle valve of the reset adjustment would flex the diaphragm moving the flapper towards the No. 2 nozzle and thereby increasing the back pressure. Closing the reset adjustment when the nozzle is wide open, would maintain a minimum back pressure.

The air pressure in No. 4 chamber assumes a value between the control valve back pressure, i.e. the chamber No. 1 pressure, and the No. 2 nozzle back pressure. The wider open the proportional band adjustment is, the closer will be this value to the control valve back pressure and, hence, the narrower is the proportional band.

Opening now the reset adjustment by a certain amount, a gradual build-up of pressure behind the diaphragm results moving the flapper towards the No. 2 nozzle.

Although both the automatic reset and the proportional band adjustment consist of needle valves, the flow through the reset adjustment will even when fully open be much smaller than that through the proportional band adjustment.

In any event, as air passes through the reset adjustment, the No. 2 nozzle back pressure will build up and in consequence the air pressure in the No. 4 chamber will increase the No. 1 nozzle back pressure, and hence the control valve air pressure.

A gradual increase of control valve air pressure is produced at a rate which is determined by the amount of opening of the reset adjustment. Thus reset action is obtained.

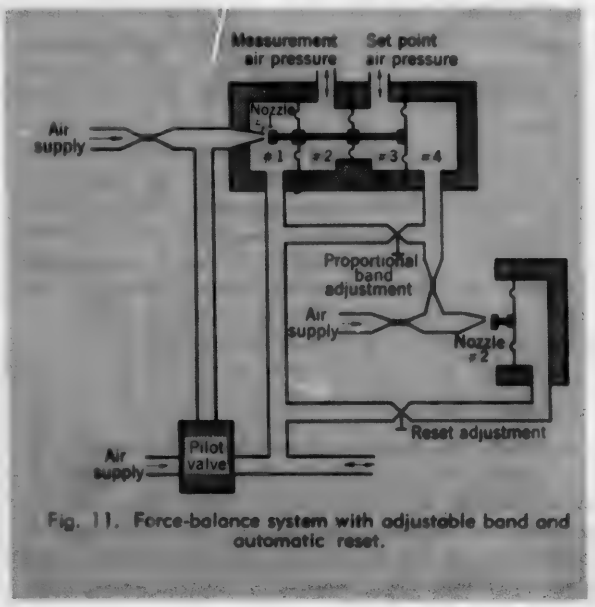


Fig. 11. Force-balance system with adjustable band and automatic reset.

The three important control modes are proportional action, reset action, and rate action.

Rate Action

Rate action is in a certain sense the opposite of reset action, and it would be possible to adjust both to such values that their effects cancel. However, with any other adjustment a composite action is obtained which gives the desired result.

What is the purpose of rate action?

To accelerate the controller action. The measurement of certain process variables, particularly of temperature, is frequently not as fast as it should be for rapid and effective control. When, for example, a change in temperature takes place, there will be a delay before the measuring element responds to the new condition. After this the measuring element will approach the new temperature relatively fast; but the nearer it gets to the new process temperature, the more it will slow down.

Rate action cannot improve the lag which delays the first response of the measuring element; but once the element senses the change and reacts relatively fast, rate action can produce a helpful acceleration, provided that this acceleration dies out as the measuring element gets into its slowing-down stage.

Since the controller action corresponds to the input from the measuring element, the acceleration, or rate action, can be applied either to the input or to the output of the controller. Both methods are actually being used although there is a marked tendency to apply it at the input because of some definite advantages which might occur under certain special conditions which are beyond the scope of this article. The basic mechanism of rate action is the same in both cases.

Assume, for example, a restriction is added in Fig. 11 which will delay the build-up of pressure in the No. 1 chamber. If, now, the measurement air pressure in the No. 2 chamber increases rapidly at the beginning and then becomes slower, in accordance with the analyzed response to a change in the measured temperature, then the restriction will make the initial controller response much larger than without the restriction, because the balancing action of the No. 1 chamber is delayed. Thus acceleration is obtained. As the rate of change in the No. 2 chamber becomes slower, the pressure in No. 1 will gradually build up to the control valve air pressure. By making the restriction adjustable, i.e. replacing it by a needle valve an adjustment is possible which will make the pressure in No. 2 chamber reach its new final value at the same moment where the pressure in No. 1 corresponds to the control valve air pressure. This is rate action.

Conclusion

This article attempted to show the action of basic mechanisms in pneumatic controllers. The interaction of proportional, reset, and rate action was discussed in their relation to the industrial process. Thus the individual parts become integrated in the control loop: from the measuring device to the controller, from the controller to the final control element, and from the final control element through the process back to the measuring device. Adjustments of proportional, reset, and rate action can be treated only in relation to the control loop. Each control loop will require different adjustments.

Tucson Cathedral Beats 106-Degree Heat

Worshippers in Tucson, Arizona, beheld a rite as old as the catacombs while basking in comfort as new as tomorrow when Monsignor Francis J. Green was consecrated auxiliary bishop of the Tucson diocese in the newly air-conditioned San Agustin Cathedral.

Rebuilding of the rectory at the Catholic school of Sts. Peter and Paul led to the cathedral project. Monsignor Green, who supervised that job, had the rectory air-conditioned by Hearn Plumbing and Heating Co. with Servel equipment. He suggested that Bishop Gercke of the diocese might want the cathedral air-conditioned.

Ralph Kerns, of the Hearn Co., and Monte Weaver, of Servel, Inc., presented the plan. The bishop was willing—with conditions. The interior of the cathedral must not be visibly changed in any way. The installation must make no noise. The work must be finished within seven weeks.

The job started from scratch. There was no ductwork. The building had previously been heated after a fashion by four floor furnaces, and had been cooled sketchily in summer by electric fans.

Return-air passages replaced the floor furnaces. Up under each pew, right against its center support, a three-inch round pipe was thrust from an air supply chamber. Each of these pipes conducted air into a metal box nearly as long as the pew, and flowed out of the box through half-inch holes. There were ten supply pipes in the sanctuary, and two air handling units in the choir loft. They were so delicately adjusted that the flowing air didn't cause the flames of the altar candles to flicker.

In a small building, which had been used for storage, two gas-fired steam boilers, two 25-ton Servel DUT water chillers, two condensate pumps and a circulating pump were installed. The chilled water was conveyed into coils in the 12 supply chambers inside the cathedral, and air was blown over the coils to carry the refreshing coolness throughout the cathedral.

The installation was finished two days before the consecration. It brought the temperature down immediately from 101 degrees—the reading outside—into the low seventies.

The day of the consecration service began with an outside temperature of nearly 100 degrees. Mass at 7 a.m. drew 600 worshippers, and raised the temperature slightly. A second service at 8 a.m., with 1,000 present, found the temperature 102 degrees outside, 77 inside. At 9 a.m., 1,200 persons—full capacity—were in the cathedral for the consecration, which lasted until noon. The 9 a.m. temperatures had been the same as at 8—102 degrees outisde, 77 inside. At noon the readings were 106 degrees outside, 81 inside.

Lewis Blankenmann on

PIPING

and PLUMBING

Basic Design Data

BEFORE the actual design work for a new project can be started, the engineer must study the architectural drawings to determine the scope of the project. Although architectural drawings are often in the preliminary stages when first received, they usually contain sufficient information concerning fixtures and the layout of the various rooms for the engineer to formulate questions related to his proposed design.

Once the function of the particular project is known, it becomes necessary to sit down with the architect and review the plans to obtain his thoughts or desires on fixtures, equipment and services. The architect usually has definite plans on what he can include in the project and yet stay within the budget limits. To this end, the engineer, having had experience on similar projects, can offer many constructive suggestions on a phase of the design in which he is better versed than the architect.

As a result, this exchange of ideas at the beginning of the project can be quite beneficial. One must consider the most practical and efficient location of fixtures, equipment and services; types of fixtures, proper sized pipe spaces and other factors relative to the overall design of the plumbing systems. Common agreement with the architect regarding the project at the beginning of the design will pave the way for a harmonious relationship throughout the course of the work.

Coordination With Other Design

In a similar manner, it is necessary to discuss the basic design with the structural, heating and ventilating, air conditioning and electrical engineers. Such discussions will aid in the planning of the plumbing design work.

These talks will clarify the scope of the structural work with regard to the type of construction, and the necessary steps to be taken to assure clearance between structural work and service piping.

Once the contemplated heating system and equipment are known, it is possible to determine the best method for furnishing service hot water for the project. Knowing the extent of the ventilation and air conditioning work will give some idea of the necessary steps to be taken in order to have the plumbing and piping systems clear the duct work.

Plans of the electrical engineer with regard to lighting fixtures and the location of electrical equipment will also aid in the necessary coordination of services and equipment. Thus familiarity with the proposed design of the engineers mentioned makes it possible to proceed with the plumbing design with some assurance.

Securing Basic Design Data

The engineer is now ready to proceed with the formulation of the basic design data. Since it is quite important that as much data as possible be obtained from varied sources and authorities such as architects, consultants, owners, utility officials, health and fire department men and other interested parties, it is good practice to use a form which can be filled in as the necessary data are secured. The use of a basic form greatly simplifies this task, since it lists all the required information. It is only necessary to enter the missing data and the required factors of design will be recorded.

The form can be used as a check list to ascertain just which plumbing services and equipment will be required for the project. A person's memory is not too reliable, especially when he is at an important design meeting. Many important questions are too often thought of only after the conference is over. The value of the suggested form for entering the necessary data for the design is now apparent.

Manner of Using Form

The form offered, contains not only the usual plumbing services generally required for a new project, but in addition also lists many of the special services and equipment that may be necessary for a hospital, research laboratory, school or other type of project. The advantage in listing all of the items is that the engineer will have a check list to guide him while discussing a proposed design. As a result, there is less possibility of overlooking a desired system or data.

In using the form, one first checks off the systems that will be required and then fills in the answers to the items listed. In this manner the necessary design data will be systematically compiled. After the basic data have been recorded, it is an easy matter to expand each system with more detailed information.

An important recommendation is that the names and telephone numbers of the various responsible parties from whom information was obtained, should also be on the form for reference. When additional information is needed, it is much easier to talk to a person who is acquainted with the project.

PLUMBING—BASIC DESIGN DATA FOR NEW WORK

Project
Name .....
Location .....
Function of building .....
Type of construction .....
Height of building .....
Number of floors .....Floor heights .....
Ultimate size of building .....
Estimated number of occupants .....

Cold Water
Street main .....Size .....Location .....
Other source.....Explain .....
Avialable pressure .....
Water analysis .....
Is roof tank required? ....Pneumatic system ....Other ....
Water company requirements .....
Proposed piping material .....

Hot Water
Method of hot water generation.
(a) Submerged coils .....
(b) Storage generators .....
(c) Indirect heaters .....
(d) Instantaneous heaters .....
(e) Other methods .....
Desired water temperatures .....
If 180F water for kitchen, how furnished? .....
Proposed piping material .....

Sanitary System
Point of discharge.
(a) Sanitary sewer ....Size ....Location ....Invert ....
(b) Septic tank system .....Location .....
(c) Elsewhere .....
Sewer department requirements .....
Obtain local code .....
Proposed piping material for soil, waste and vents.....

Storm System
Point of discharge.
(a) Storm sewer .....Location....Size....Invert....
(b) Combined sewer ....Location....Size....Invert....
(c) Curb .....Stream .....
(d) Dry wells .....Location .....
(e) Elsewhere .....Explain .....
Roof drains .....Type of roof construction .....
Area drains .....Footing drains .....Other .....
Rainfall data for local area .....
Sewer department requirements .....
Local code requirements .....
Proposed piping material .....

Fire Standpipe System
Source of water .....Size .....Location .....
Available pressure .....Required pressure .....
Is roof tank required .....Size .....
Is fire pump required .....Capacity, gpm .....
Hose racks.
(a) Exposed .....Hose cabinet .....
(b) Diameter of hose .....
(c) Hose thread requirements .....
Governing code .....
Local fire department requirements .....
Proposed piping material .....Sizes .....

Sprinkler System
Source of water .....Size .....Location .....
Available pressure .....Required pressure .....
Classification of proposed system .....
Spacing of sprinkler heads .....Temperature rating .....
Is roof tank required .....Size .....
Is fire pump required .....Capacity, gpm .....
Governing code .....
Local fire department requirements .....
Proposed piping material .....

Other Fire Protection Systems
Dry type sprinkler system .....
CO_2 system .....
Foam system .....
Fog system .....
Wetting agents .....
Outside fire protection .....
Other types of systems .....
Types of extinguishing agents.
(a) Portable .....Type .....Capacity .....
(b) Complete piping system .....
If complete piping system,
(a) How stored .....Location .....Capacity .....
(b) Manufacturers requirements .....
(c) Proposed piping material ..... Sizes .....
Governing code .....
Local fire department requirements .....

Gas System
Source of gas.
(a) Manufactured ....Natural....Propane....Other....
(b) Btu content .....Required quantity .....
If gas main is available.
(a) Size .....Pressure .....Location .....
If gas is to be diluted at site,
(a) Amount of dilution .....
(b) Location of dilution equipment .....
(c) Type of dilution equipment used .....
(d) Manufacturers requirements .....
Location of gas meter .....Type .....Size .....
Local gas company requirements .....
Proposed piping material .....

Oxygen System
Quantity required .....Pressure .....
How stored .....Location .....
Demand requirements .....
Fixtures, equipment or outlets supplied .....
Manufacturers instructions .....
Proposed piping material .....
Safety precautions .....

Hydrogen System
Quantity required .....Pressure .....
How stored .....Location .....
Demand requirements .....
Fixtures, equipment or outlets supplied .....
Manufacturers instructions .....
Proposed piping material .....
Safety precautions .....

Nitrogen System
Quantity required .....Pressure .....
How stored .....Location .....
Demand requirements .....
Fixtures, equipment or outlets supplied .....
Manufacturers instructions .....
Proposed piping material .....
Safety precautions .....

Compressed Air System
Quantity required .....Pressure .....
Compressor equipment .....Type .....Location .....
Per cent of moisture to be removed .....
Demand requirements .....
Receiving tank .....Size .....Location .....
Fixtures, equipment or outlets supplied .....
Manufacturers instructions .....
Proposed piping material .....
Safety precautions .....

Distilled Water—Demineralized Water
Quantity required .....Pressure .....
Type of equipment used .....Location .....
Storage capacity .....Purity requirements .....
Demand requirements .....

Fixtures, equipment or outlets supplied .....
Manufacturers' Instructions .....
Proposed special piping material .....

Vacuum System
Vacuum producer .....Type .....Location .....
Capacity of equipment .....
Number of outlets .....Type .....
Manufacturers' Instructions .....
Proposed piping material .....

Industrial or Laboratory Waste System
Quantity of waste .....
Waste characteristics .....
Will waste require:
(a) Dilution .....
(b) Neutralizing .....
(c) Chemical treatment .....
(d) Settling .....
Is treatment required? .....Location of equipment .....
Testing equipment .....
Proposed point of discharge .....
Governing code .....
Proposed piping material .....

Plumbing Fixtures
Water closets .....Quantity.....Type.....
Urinals .....Quantity.....Type.....
Lavatories .....Quantity.....Type.....
Bathtubs .....Quantity.....Type.....
Sinks .....Quantity.....Type.....
Laundry trays .....Quantity.....Type.....
Wash trays .....Quantity.....Type.....
Wash fountains .....Quantity.....Type.....
Drinking fountains .....Quantity.....Type.....
Showers .....Quantity.....Type.....
Dish washers .....Size .....Type.....
Washing machines .....Quantity.....Type.....
Other fixtures .....Quantity.....Type.....
How are fixtures to be supported .....

Hospital Fixtures and Equipment
The quantity and type of these fixtures and equipment should be furnished by the architect or hospital consultant.

Laboratory Fixtures and Equipment
The quantity and type of these fixtures and equipment should be furnished by the architect or laboratory consultant.

Kitchen Equipment
A layout of the kitchen fixtures and equipment should be furnished by the kitchen equipment contractor.

Special Fixtures and Equipment
Information on special fixtures or equipment requiring water, waste or other services for industrial, manufacturing, processing or other specialized purposes, should be furnished by the architect or owners.

Miscellaneous Piping or Equipment
Use this space for any fixtures, equipment or services not previously covered.

Water Demand Rates for Drinking Water Coolers

Interesting data regarding the average duration of a drink from an electrically operated drinking water cooler, and the cooler location and peak demands were included in a paper on Water Demand Rates for Drinking Water Coolers, by P. R. Achenbach and C. W. Phillips of the National Bureau of Standards, Washington, D. C. This paper was presented at the fiftieth annual meeting of the American Society of Refrigerating Engineers.

The peak draw requirements are usually met by providing a storage tank in the cooler to augment the steady state capacity during periods of maximum demand. In fact, the size of the storage tank is frequently determined by the peak draw requirement. Although the incorporation of a storage tank permits the use of a smaller condensing unit than would otherwise be necessary, some manufacturers build instantaneous type coolers.

The validity of the peak draw requirements has frequently been questioned because drinking water coolers could be made simpler, smaller, and cheaper if this requirement were eliminated. To provide information on water demand rates for electrically operated drinking water coolers, 16 stations were selected for study. This group consisted of installations in office buildings, mess halls, classrooms, military barracks, a garage and a bus terminal. Data were taken at each station by photographic methods.

The study indicated that there is some differences in drinking habits with respect to occupation, freedom to use the coolers at all times, the location of the cooler, and the presence of several drinking fountains in the same area. The principal conclusions derived from this study follow:

An hourly water usage of 0.05 to 0.075 gph per person can be expected in hot weather where those served have ready access to the cooler and are engaged in relatively light work. Where an appreciable amount of manual labor is performed, water usage will probably be above this range.

The average hourly water use did not reach the nominal 10 gph capacity at any of the stations studied. At half of the stations, the hourly use did not exceed 5 gph.

The peak usage of water in 15 minutes, exceeded 1½ times the hourly rate required of a 10 gph cooler at six of the 16 stations studied. At most of these stations, the people were prevented from drinking for periods of time by their occupation and were then released as a group for a rest period of intermission. Some conditions appeared to be conducive to high peak usage.

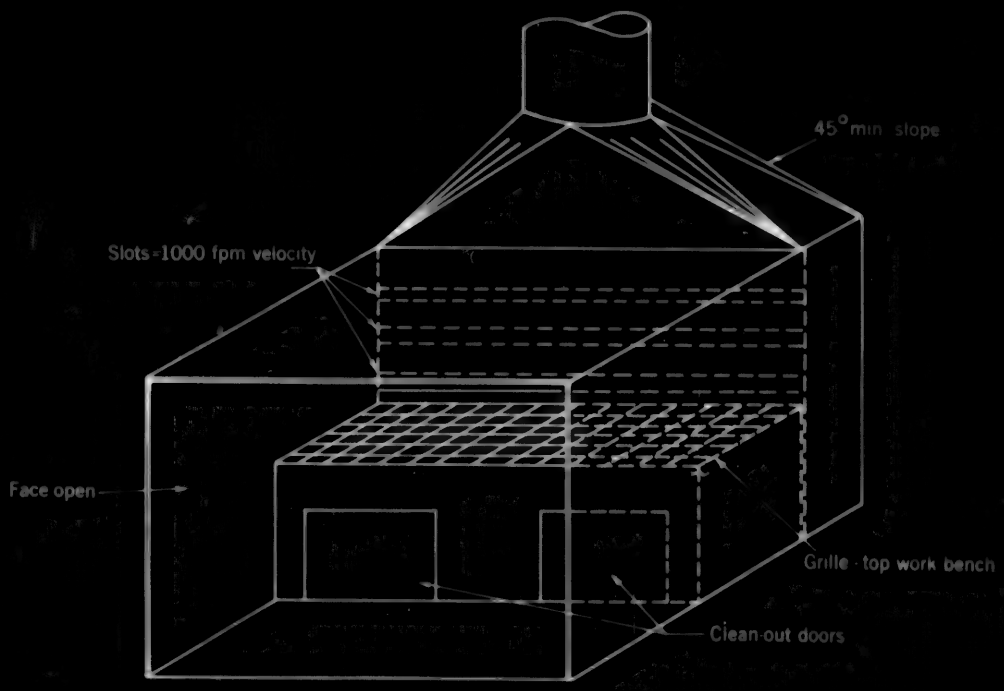
The ratio of the number of drinks taken in 15 minutes to the number of people served by the cooler approached 100 percent for the classrooms studied. On an hourly basis, this ratio ranged from 112 to 168 per cent for one-half of the group.

The average duration of a drink from the bubbler type cooler was six seconds and the average water usage was 0.055 gallon per drink or a little less than one-half pint.

The rate of water usage could not be correlated with outdoor temperature on an hour-by-hour basis but peak usages of water occurred more than twice as often on days with a maximum outdoor temperature of 90F or higher as on cooler days.

The ratio of the peak flow rate for 15 minutes to the average hourly rate of water withdrawal was greater than 150 per cent at 13 of the 16 stations. The ratio was above 200 per cent for 7 stations and reached a maximum of 308 per cent. These values indicate that a ratio of 150 per cent between peak draw rate and hourly rate as required by current specifications is inadequate for some applications and that greater storage capacity may be needed.

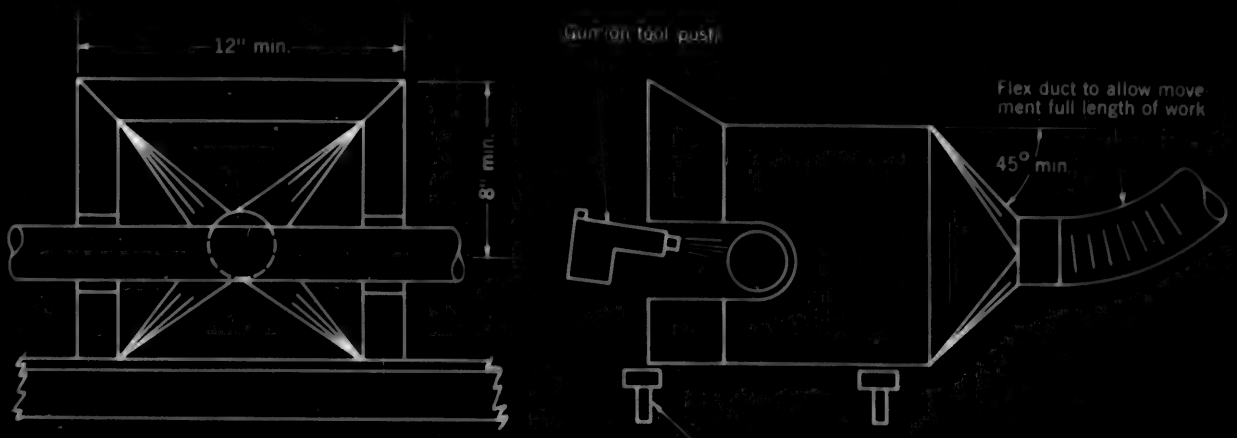
BOOTH FOR METAL SPRAYING



Metallizing booth

Non-toxic: Q=125 cfm per sq ft face area Toxic: Provide Bureau of Mines approved air-supplied respirator
Q= [illegible] cfm per sq ft face area

Duct velocity 4000 fpm min.
Entry loss=1.78 Slot VP+0.25 duct VP
Small lathes etc. may be mounted in booth



Lateral hood

Note: [illegible] not satisfactory for [illegible] metals

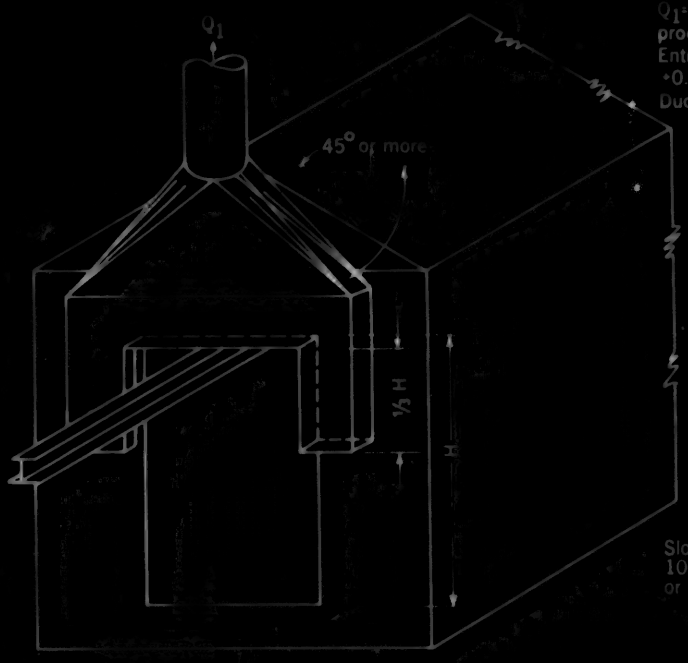
Q=200 cfm per sq ft face opening
Duct velocity=3500 fpm min.
Entry loss=0.25 VP

Hood extends as low as possible to clear lathe rail
Hood may be connected to move with tool rest

CUT ALONG THIS LINE

HOOD DETAILS FOR BAKING OVEN OR DRIER

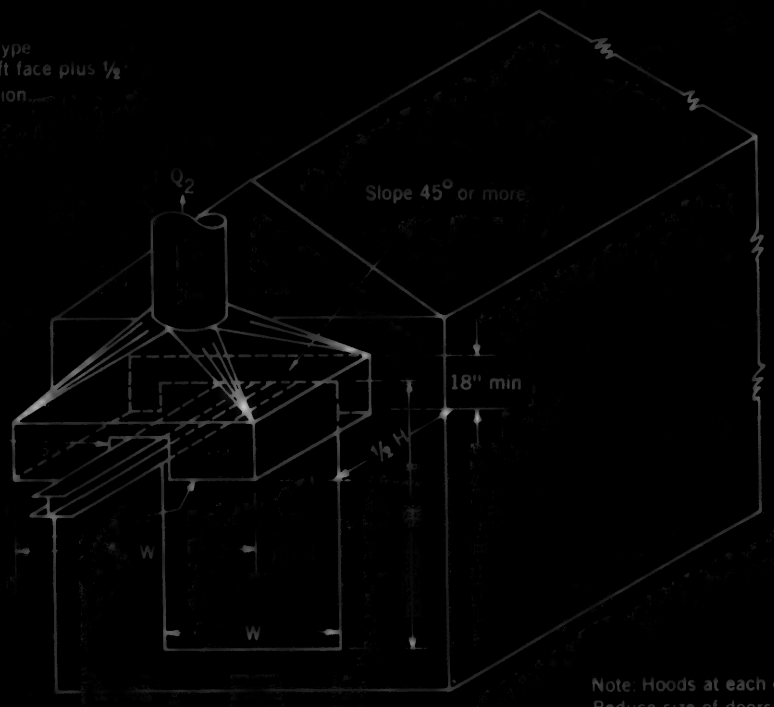
Slot type
Q_1=100 cfm per sq ft door plus ½ products of combustion
Entry loss=1.0 slot VP
+0.25 duct VP
Duct velocity=1500 to 2000 fpm



Size large end of transition for 500 fpm max.

Slot on three sides size for 1000 fpm. Locate on inside or outside of door

Canopy type
Q_2=200 cfm per sq ft face plus ½ products of combustion
Entry loss=0.25 VP



Note: Hoods at each end of oven
Reduce size of doors as much as possible.
Separate vent must be added for products of combustion.

[illegible] AMERICAN [illegible] OF
GOVERNMENTAL INDUSTRIAL [illegible]

Detail Sheet AIR CONDITIONING, HEATING AND VENTILATING January, 1955

Preview of Events at Philadelphia

The 12th International Heating and Ventilating Exposition will be held at the Commercial Museum, Philadelphia, Pa., January 24-28, in conjunction with the 61st annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at the Bellevue-Stratford Hotel, January 24 to 27. Following are facts about and list of exhibitors at the exposition and the program planned for the convention.

Exhibitors at the 12th International Heating and Ventilating Exposition

Facts about the Exposition

Title: The 12th International Heating and Ventilating Exposition.

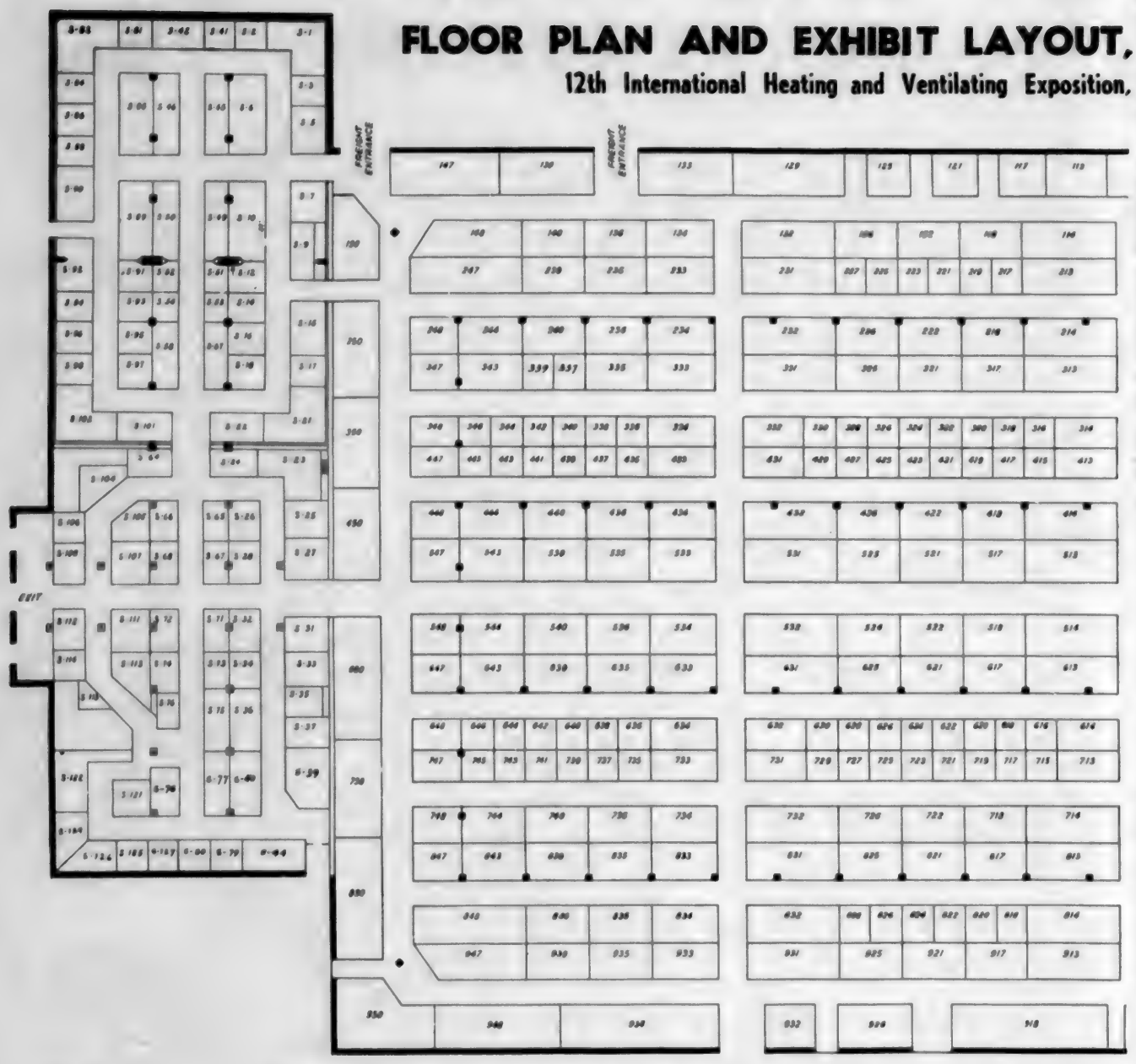
Place: Commercial Museum, Philadelphia, Pa.

Time: Monday, January 24, 2 p.m. to 10 p.m.
Tuesday, January 25 through Thursday, January 27, inclusive, 12 noon to 10 p.m.
Friday, January 28, 12 noon to 6 p.m.

Exhibitor	Space No.
A-J Manufacturing Co.	413
A-P Controls Corp.	744
ACEC Electric Corp.	426
Acme Industries, Inc.	501
Acme Mfg. Co.	S-18
Addison Products Co.	C-62
Adelta Manufacturing Co.	634
Air Conditioning, Heating and Ventilating	C-12
Air Control Products, Inc.	25
Air Devices, Inc.	533
Airfan Engrg. Co.	C-25
Air-Maze Corp.	109
Air-Path Products Co.	S-81
Air & Refrigeration Corp.	69
Airtemp Div., Chrysler Corp.	636 to 646
Airtherm Mfg. Co.	713
Ajax Boiler & Heater Co.	S-34
Alco Valve Co.	322
Aldrich Co.	630-632
Allen-Bradley Co.	338-340-342
Allis-Chalmers Mfg. Co.	C-19
American Air Filter Co., Inc.	C-116, C-118, C-122, C-126, C-130
American Blower Corp.	22, 24
American Coils Co.	613
American District Steam Co., Inc.	705-707
American Furnace Co.	77
American Gilsonite Co.	847
American Hydrovac-Pump Division of Pitz Foundry Inc.	735-737
American Machine & Metals, Inc., DeBothezat Fans Div.	210
American Radiator & Standard Sanitary Corp.	26, 28, 47, 49
American Society of Heating & Air-Conditioning Engineers, Inc.	68
Ammerman Co., C. L.	S-49
Anderson Co., The V. D.	725
Anemostat Corp. of America	406-408
Armstrong Furnace Co.	1-3
Armstrong Machine Works	626-628
Armstrong Steam Trap Co.	626-628
Arrow-Hart & Hegeman Electric Co., The	S-72
Atlantic Pipebending & Fabricating Corp.	308
Auer Register Co., The	C-59
Aurora Pump Co., Subsidiary of The New York Air Brake Co.	C-27, C-29
Au-Temp-Co Corp.	C-34
Auto-Flo Corp.	32
Automatic Devices Co., Inc.	314
Automatic Firing Corp.	905-907
B-I-F Industries, Inc.	C-43
Bacharach Industrial Instrument Co.	415
Baltimore Aircoil Co., Inc.	C-17
Barber-Colman Co.	602
Barber-Colman Co., Wheelco Instruments Div.	337
Barkow Mfg. Co., Aug. G., Inc.	C-37
Barnes & Jones, Inc.	63
Barry Blower Co.	S-49
Bell & Gosset Co.	828-832
Berger Furnace Corp.	S-71, S-73
Bertram Co., The Harvey P.	S-25
Bett-Marr Mfg. Co.	441
Binks Mfg. Co.	236
Bonair Products, Inc.	S-3, S-5
Borg-Warner Corp., Hydraline Products Div.	436
Brandes Co.	S-17
Breidert Co., The G. C.	S-107
Brookside Products Co., Inc.	S-52, S-54
Brown Products Co.	703
Brundage Co., The	331
Brunner Mfg. Co.	600
Bryant Heater Div., Affiliated Gas Equipment, Inc.	C-114
Buffalo Forge Co.	522-526
Builders-Providence Co., Inc.	C-43
Burgess-Manning Co., Architectural Products Div.	616-618
Burnham Corp., Boiler Div.	401
Bush Mfg. Co., The	250
Byers Co., A. M.	240
Cambridge Filter Corp.	S-67
Carey Mfg. Co., The Philip	S-121
Carnes Co., W. R.	521
Carrier Corp.	204-206
Carver Pump Co.	743
Century Electric Co.	900
Century Engrg. Corp.	502
Chace Co., W. M.	316
Champion Blower & Forge Co.	643
Char-Gale Mfg. Co.	726
Chelsea Fan & Blower Co., Inc.	244
Chicago Blower Corp.	48
Chicago Pump Co.	201-205
Chrysler Corp., Airtemp Div.	636 to 646
Circle Air Industries, Inc.	S-23
Clarage Fan Co.	C-170
Clayton & Lambert Mfg. Co.	C-64
Cleaver-Brooks Co., Boiler Div.	147
Cleaver-Brooks Co., Burner Div.	932
Cleveland Heater Co., The, Air Controls Div.	617
Cobell Industries, Inc.	S-96
Cole Hot Blast Mfg. Co.	S-76
Coleman Co., Inc., The	539-543-547
Columbia Burner Co., The	C-35
Combustion Control Div., Electronics Corporation of America	55
Combustioneer Div., The Steel Products Engrg. Co.	133
Commercial Filters Corp.	431
Committee on Steel Pipe Research, American Iron & Steel Institute	309
Condensation Engineering Corp.	226
Congress Drives Div., Tann Corp.	647
Connor Engineering Corp.	813
Continental Air Filters, Inc.	926
Copeland Refrigeration Corp.	C-129
Corbman Bros.	234
Cory Corp.	C-158
Crane Co.	134-233-235-239
Crise Controls Div., The Acro Mfg. Co.	332
Curtis Refrigerating Machine Div., Curtis Mfg. Co.	51
Cutler-Hammer, Inc.	208
Daffin Mfg. Co.	C-51
Davidson Fan Co.	422
Dayton Rubber Co., The	443-445
DeBothezat Fans Div., American Machine & Metals, Inc.	210
Delavan Mfg. Co.	4
Delco Products Div., General Motors Corp.	S-31, S-33
Delta Heating Corp.	150
Detroit Controls Corp.	35
Devices, Inc.	302
Diehl Manufacturing Co.	739
Dielectric Products Co., Inc.	S-37
Dodge Corp., F. W.	C-31
Doerr Electric Corp.	C-121
Dole Valve Co., The	421-423
Dollinger Corp.	304
Donaldson Div., Marvin D. Shafer Co.	C-55
Dongan Electric Mfg. Co.	S-35
Doyle Vacuum Cleaner Co.	C-22
Dravo Corp.	639
Drayer-Hanson, Inc.	214
Dunham Co., C. A.	C-150, C-151
duPont de Nemours & Co., Inc., E. I. Kinetic Chemicals Div.	335
Durant Insulated Pipe Co.	S-14
Duro-Dyne Corp.	C-33
Dwyer Mfg. Co., F. W.	715
Eagan Co., Inc., Walter H.	348
Eckhart Mfg. Co., Inc.	330
Eddington Metal Specialty Co.	209
Ejay Baseboard Mfg. Co.	C-53
Electriglas Corp.	843

FLOOR PLAN AND EXHIBIT LAYOUT,

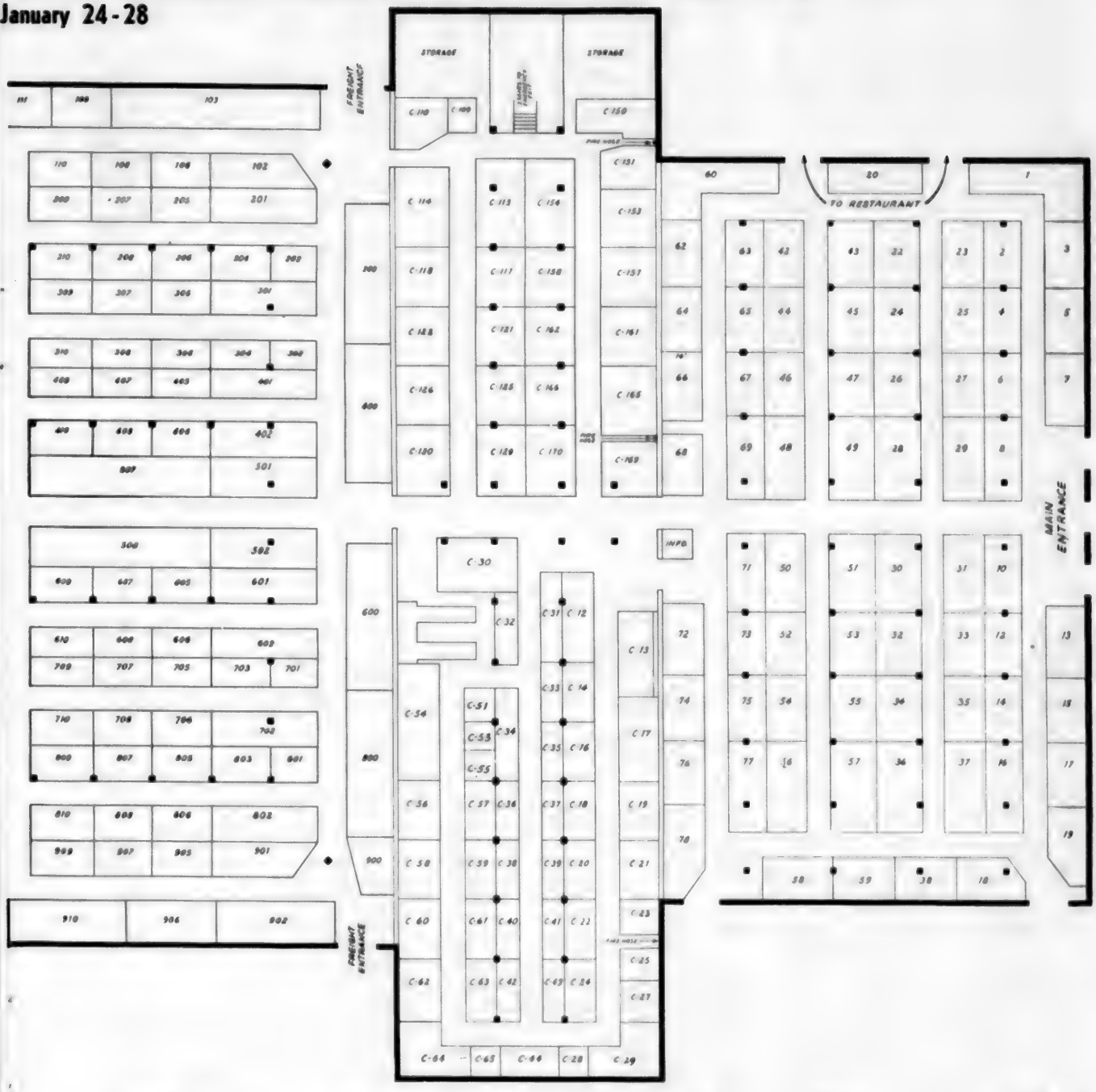
12th International Heating and Ventilating Exposition,



Exhibitor	Space No.
Electro-Air Cleaner Co.	S-9
Electro-Therm, Inc.	745
Elgen Mfg. Corp.	S-92
Emerson Electric Mfg. Co., The	718-722
Emerson Radio and Phonograph Corp.	803
Empire Chemical Products Co.	S-66
Engel Sheet Metal Equipment, Inc.	16
Evans Corp., The George	C-153
Excelsior Steel Furnace Co., The	S-65
Fairbanks Co., The	434
Farr Co.	10
Fasco Industries, Inc.	306
Fedders-Quigan Corp.	300
Federal Boiler Co., Inc.	218-222
Field Control Div. of H. D. Conkey & Co.	C-24
Fitzgibbons Boiler Co., Inc.	525-531
Flexible Tubing Corp.	C-156
Flexonics Corp.	S-127
Food Machinery & Chemical Corp., Peerless Pump Div.	723
Forest City Foundries Co., The	C-44
Fostoria Pressed Steel Corp., The	C-117
Freeman Heating Div., Illinois Iron & Bolt Co.	S-112, S-114
Frick Co.	317
Frigidaire Div., General Motors Corp.	52-54
Fulton Sylphon Div., Robertshaw Fulton Controls Co.	334-336
Gallaher Co., The	248
General Automatic Products Corp.	14
General Blower Co.	425-427
General Chemical Div., Allied Chemical Dye Corp.	S-95, S-97
General Controls Co.	56
General Electric Co., Apparatus Sales Div.	933-935
General Electric Co., Commercial & Industrial Air Conditioning Dept.	C-113
General Electric Co., Weathertron Dept.	347
General Filters, Inc.	6
General Fittings Co.	S-36
General Gas Light Co.	313
General Heating Products Co.	S-57
General Register Corp.	C-40
Gerwin Industries, Inc., Thermo-Base Div.	S-101
Gibson Industries, Inc.	S-113
Goodfellow Co., Inc., E. D.	614
Goodyear Tire & Rubber Co., Inc., The	939
Goulds Pumps, Inc.	C-20
Governair Corp.	601
Graham Mfg. Corp.	S-98
Gustin-Bacon Mfg. Co.	740
Halstead & Mitchell	C-36
Harris & Co., Arthur	620
Hart & Cooley Mfg. Co.	610
Hastings Air Control, Inc.	S-45
Heat-Timer Corp.	C-34
Heating and Ventilating	C-12
Heil Co., The	122-126-132
Henry Furnace Co., The	36, 57
Herbster Products Co.	S-22
Herco Oil Burner Corp., Div. of Herr & Co., Inc.	S-108
Hi-Flow Products, Inc.	727

COMMERCIAL MUSEUM, PHILADELPHIA, PA.

January 24-28



Exhibitor	Space No.
Hoffman Specialty Co.	802
HomEase Products Div.	407
Howard Industries, Inc.	S-75
Huck Manufacturing Co.	S-124
Hydraline Products Div., Borg-Warner Corp.	436
Hydrotherm, Inc.	836
Hy-Lo Burner Co., Inc.	C-28
Ilg Electric Ventilating Co.	633
Illinois Engineering Co.	C-109, C-110
Illinois Iron & Bolt Co., Freeman Heating Div.	S-112, S-114
Illinois Testing Laboratories, Inc.	805
Imperial Brass Mfg. Co., Inc., The	202
Independent Register Co., The	701
Industrial Press, The	C-12
Industrial Sound Control, Inc.	S-27
Infra Insulation, Inc.	S-104
Ingersoll-Rand Co.	901
Insulating Concrete Corp.	118
International Heater Co.	514
International Oil Burner Co.	S-32
Iron Fireman Mfg. Co.	60
Iron Fireman Mfg. Co., Petro Div.	2
Jackson & Church, Furnace Div.	102-106
Janitrol Heating & Air Conditioning Div., Surface Combustion Corp.	15-17-19
Jefferson Electric Co.	820
Jenkins Bros.	450
Jenn Air Products Co., Inc.	27
Johns-Manville Sales Corp.	702
Johnson Co., S. T.	822-824-826
Johnson Service Co.	42-44-46
Kaiser Co., E. B.	247
Kaustine Furnace & Tank Corp.	305-307
Kennard Corp.	C-30, C-32
Kent Co., The	447
Kewanee-Ross Corp.	43-45
Kinney Mfg. Co., Subsidiary of The New York Air Brake Co.	C-27, C-29
Kody Blower Co.	S-6
Korfund Co., Inc., The	548

Exhibitor	Space No.
Kritzer Radiant Coils, Inc.	732
Lau Blower Co., The	72
Lewin-Mathes Co.	709
Libbey-Owens-Ford Glass Co.	34
Lima Register Co., The	74
Lipman Refrigertion Div., Yates-American Machine Co.	117
Lockformer Co., The	731
McDonnell & Miller, Inc.	734
McQuay, Inc.	33
Magnaflow Pump Corp.	S-105
Magnetrol, Inc.	417-419
Maid-O'-Mist, Inc.	648
Mammoth Furnace Co., The	S-82
Manville Boiler Co., Inc.	440
Marathon Electric Mfg. Corp.	S-85
Marietta Metal Products Corp.	53
Marley Co., The	325
Mario Coil Co.	73-75
Marsh Heating Equipment Co.	37
Maxitrol Co.	333
Mercoid Corp., The	13
Metalbestos Div., William Wallace Co.	S-88
Metals & Controls Corp., Spencer Thermostat Div.	50
Metromatic Mfg. Co.	121-125
Metropolitan Refining Co., Inc.	C-38
Mid-Continent Metal Products Co.	710
Miller Valve Co., Inc.	320
Milwaukee Electric Tool Corp.	C-16
Milwaukee Gas Specialty Co.	444
Milwaukee Valve Co.	740
Minneapolis-Honeywell Regulator Co.	103
Mirror Patented Stove Pipe Co.	721
Mitchell Mfg. Co.	631
Modine Mfg. Co.	934
Monarch Mfg. Works, Inc.	810
Morris Sheet Metal Works	S-78
Morrison Products, Inc.	605
Morrison Steel Products, Inc.	140-148
Morse-Smith-Morse Co., The	S-16
Morton, Paul S., Engineering Service	S-115
Mueller Climatrol	913-917, 921-925
Multi-Vent Div., The Pyle-National Co.	C-21
Muncie Gear Works, Inc.	C-14
Nash Engrg. Co., The	400
National Heater Co., Inc.	S-10
National Heating Products Sales, Ltd.	S-74
National Radiator Co., The	507
National Radiator Co., The Viking Air Conditioning Div.	402
Nelson Div., Herman, American Air Filter Co., Inc.	C-116, C-118
Nesbitt, Inc., John J.	C-157, C-161, C-165, C-169
New York Air Brake Co., The	C-27, C-29
New York Blower Co., The	350
Niagara Blower Co.	513-517
Niagara Furnace Div., The Forest City Foundries Co.	C-44
Niagara Machine & Tool Works	706-708
Norman Products Co.	848 & 947
Olsen Mfg. Co., The C. A.	36 & 57
Orr & Sembower, Inc.	800
Owens-Corning Fiberglas Corp.	S-42
Pacific Steel Boiler Div., U. S. Radiator Corp.	30
Paragon Electric Co.	717-719
Patten Co., J. V.	110
Patterson-Kelley Co., Inc., The	909
Peerless Electric Co., The	410
Peerless Pump Div., Food Machinery & Chemical Corp.	723
Peerless Sales Div.	S-2 & S-41
Penn Boiler & Burner Mfg. Corp.	C-115
Penn Controls, Inc.	23
Pennsylvania Furnace & Iron Co.	806
Perfection Stove Co.	18, 38
Perfex Corp.	532
Petro Div., Iron Fireman Mfg. Co.	2
Phillips Drill Co.	S-64
Pittsburgh Plate Glass Co., Fiber Glass Div.	748
Powers Regulator Co., The	433-435
Prat-Daniel Corp., Thermobloc Div.	C-166
Preferred Utilities Mfg. Corp.	850
Premier Co.	S-126
Primor Products, Inc.	S-21
Pullman Vacuum Cleaner Corp.	429
Pyle-National Co., The, Multi-Vent Div.	C-21
Quickdraft Co., Div. Herring-Hall-Marvin Safe Co.	S-77
Quiet Heet Mfg. Corp.	803
Quiet-Kool Corp.	803
Quincy Stove Mfg. Co.	S-51, S-53
R.C.S. Tool Sales Corp.	339
Radiant-Ray Radiation, Inc.	310
Radiant Utilities Corp.	217
Radio Corporation of America, Engineering Products Div.	S-84, S-86
Ralph Mfg. Co.	622-624
Randall Graphite Bearings, Inc.	65
Redmond Co., Inc.	608
Reflectal Corp., Subsidiary of Borg-Warner Corp.	326
Remington Arms Co., Inc.	808
Republic Products Co.	S-57
Research Products Corp.	448
Rheem Mfg. Co.	301
Richmond Engineering Co., Inc.	S-68
Richmond Radiator Co.	831
Ric-wil Co., The	606
Ridge Tool Co., The	S-44, S-79
Rittling Corp., The	S-7
Roberts-Gordon Appliance Corp.	607-609
Robertshaw Fulton Controls Co., Fulton Sylphon Div.	334-336
Rockwell Spring & Axle Co., Timken Silent Automatic Div.	621-625
Rome-Turney Radiator Co.	741
Roy E. Roth Co.	S-1
Russell Co., The F. C.	817
Sarco Co., Inc.	213
Schecter Brothers Co.	S-91
Scully Signal Co.	833
Sequoia Mfg. Co.	C-39
Servel, Inc.	807-809
Shafer Co., Marvin D., Donaldson Div.	C-55
Shana Manufacturing, Inc.	S-46
Siemon Mfg. Co.	C-61
Simplaire	C-154
Skuttle Mfg. Co.	S-58
Slant-Fin Radiator Corp.	S-125
Smith Corp., A. O.	714
Smith Co., Inc., The H. B.	321
Sparkler Mfg. Co.	S-26
Spencer Heater, Lycoming Div., Avco Mfg. Corp.	129
Spencer Thermostat Div., Metals & Controls Corp.	50
Spi-Rol-Fin Corp.	S-111
Sporlan Valve Co.	729
Sprague Electric Co.	S-93
Square D Co.	S-94
Standard Stamping & Perforating Co.	344
Steel Products Engineering Co., The, Combustioneer Div.	133
Stephens-Adamson Mfg. Co.	C-41
Stewart Mfg. Co., Inc.	840
Stewart-Warner Corp., U. S. Machine Div.	111-113
Strong, Carlisle & Hammond Co.	C-23
Sturtevant Div., Westinghouse Electric Corp.	534-536-540-544
Sunbeam Air Conditioner Div., American Radiator & Standard Sanitary Corp.	20
Sundstrand Engineering Co.	818
Sundstrand Machine Tool Co., Hydraulic Div.	231
Sun-Ray Burner Mfg. Corp.	139
Surface Combustion Corp., Janitrol Heating & Air Conditioning Div.	15-17-19
Synchronous Flame, Inc.	S-39
Syncromatic Corp.	29
Taco Heaters, Inc.	518
Tann Corp., Congress Drives Div.	647
Tecumseh Products Co.	62
Temco, Inc.	814
Thatcher Furnace Co.	508
Thermobloc Div., Prat-Daniel Corp.	C-166
Therm-O-Wheel, Inc.	S-102
Thrush & Co., H. A.	C-63
Timken Silent Automatic Div., Rockwell Spring & Axel Co.	621-625
Titus, Inc.	747
Titus Mfg. Corp.	750
Torrington Mfg. Co., The	67
Trane Co., The	902-906-910-918
Trion, Inc.	76-78
Tuttle & Bailey, Inc.	31
Typhoon Air Conditioning Co., Inc.	650
Union Asbestos & Rubber Co.	C-54, C-56, C-58
Union Electric & Mfg. Co.	136
United States Air Conditioning Corp.	58-59
U. S. Electrical Motors, Inc.	C-162
U. S. Machine Div., Stewart-Warner Corp.	111-113
U. S. Radiator Corp.	8
U. S. Radiator Corp., Pacific Steel Boiler Div.	30
United States Register Co.	733
United States Rubber Co.	S-40
Universal Diffuser Corp.	439
Utility Appliance Corp.	635
Utility Fan Corp.	346
V & E Products, Inc.	821
Van-Packer Corp.	825
Vapor Heating Corp.	S-28
Velan Engineering Ltd.	S-90
Velocity-Power Tool Co.	328
Vibration Eliminator Co., The	C-42
Vibration Mountings, Inc.	S-24
Viking Air Conditioning Div., The National Radiator Co.	402
Vulcan Radiator Co., The	409
Wagner Electric Corp.	834
Walker Mfg. & Sales Corp.	405
William Wallace Co., Metalbestos Div.	S-88
Walton Laboratories, Inc.	C-13
Warren Webster & Co.	414-418
Waterfilm Boilers, Inc.	C-125
Waterman-Waterbury Co., The	114
Watts Regulator Co.	232
Wayne Home Equipment Co., Inc.	C-155
Webster Electric Co.	7
Weil-McLain Co.	432
Westinghouse Electric Corp.	71
Westinghouse Electric Corp., Sturtevant Div.	534-536-540-544
White-Rodgers Electric Co.	64-66
Whitehall Engineering Co.	C-60
Williams Div., Eureka Williams Co., Div. of Henney Motor Co., Inc.	835-839
Windmaster Corp.	C-57
Wing Mfg. Co., L. J.	200
Worthington Corp.	948-950
XXth Century Heating & Ventilating Co., The	207
Yates-American Machine Co., Lipman Refrigeration Div.	117
York Corp.	221-223-225-227
York-Shipley, Inc.	S-50 & S-89
Young Radiator Co.	931
Young Regulator Co.	801
Zatko Metal Products Co.	S-15
Zonolite Co., Z-Crete Div.	118

ASHAE Meets at Philadelphia

The 61st annual meeting of the American Society of Heating and Ventilating Engineers, and the first under its new name—American Society of Heating and Air-Conditioning Engineers—will open officially at the Bellevue-Stratford Hotel, Philadelphia, Monday, January 24, at 9:30 a.m. At 2 p.m. the same day the 12th International Heating and Ventilating Exposition, sponsored by ASHAE, will open at the Commercial Museum with over 400 manufacturers exhibiting the latest in heating and air conditioning equipment.

The technical sessions of the Society will open each day, Monday through Thursday, at 9:30 a.m. Except for the Monday meeting in the Clover Room, all sessions will be held in the Ballroom. The Exposition will be open Tuesday through Thursday from noon until 10 p.m. On Monday, it opens at 2 p.m.; it closes Friday at 6 p.m.

Technical Papers

An excellent selection of technical papers for the four technical sessions has been arranged by the Program and Papers Committee under the chairmanship of B. H. Spurlock, Jr., professor in the Department of Mechanical Engineering, University of Colorado.

The Committee on Arrangements, headed by General Chairman John McElgin of the Philadelphia Chapter, has arranged a number of special events beginning with a Welcome Tea Sunday afternoon.

Luncheon and Banquet

A Welcome Luncheon will be addressed by Joseph S. Clark, Jr., Mayor of Philadelphia, on Monday, and that night an evening of fun is scheduled. Wednesday evening is the Annual Banquet at which time the new officers will be installed, Charles S. Leopold will receive the F. Paul Anderson Medal, L. N. Hunter will receive the past president's emblem, and the speaker will be Dr. Milton S. Eisenhower.

All week long there also will be special events for the ladies, such as historic tours, a fashion show, and a trip to Atlantic City.

TECHNICAL PROGRAM OF 61st ANNUAL MEETING
AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC.

• Bellevue-Stratford Hotel, Philadelphia, Pa. •

Monday — January 24

9:00 a.m. Registration

9:30 a.m. Technical Session

Ventilation Requirements for Cigarette Smoke, by C. P. Yaglou

A Rapid General Purpose Centrifuge Sedimentation Method for Measurement of Size Distribution of Small Particles, by K. T. Whitby

Evaluation of Panel-Type Air Cleaners by Means of Atmospheric Dust, by H. A. Endres, W. T. Van Orman and R. P. Carter, Jr.

12:15 p.m. Welcome Luncheon

Tuesday — January 25

9:30 a.m. Technical Session

Report of Committee on Research—R. S. Dill, Chairman

Preliminary Studies of Heat Removal by a Cooled Ceiling Panel, by L. F. Schutrum, John Vouris and T. C. Min

Measurement of Angular Emissivity, by A. Umur, G. V. Parmelee and L. F. Schutrum

Circuit Analysis Applied to Load Estimating, Phase II, by H. B. Nottage and G. V. Parmelee

Wednesday — January 26

9:30 a.m. Technical Session

Gas is an Important Factor in the Thermal Conductivity of Most Insulating Materials, Part II, by R. M. Lander

Selection of Outside Design Temperature for Heat Load Estimation, by M. L. Ghai and P. Sundaram

Study of Liquid-to-Liquid Heat Transfer in Hot Water Heaters, by F. W. Hutchinson, L. J. La Tart and N. W. Smith

Solar Radiation during Cloudless Days, by J. L. Threlkeld and R. C. Jordan

7:00 p.m. Banquet

Toastmaster: A. J. Nesbitt

Speaker: Dr. Milton Eisenhower, President, The Pennsylvania State University

Thursday — January 27

9:30 a.m. Technical Session

Paths of Horizontally Projected Heated and Chilled Air Jets, by Alfred Koestel

Air Conditioning of Multi-Room Buildings, by R. W. Waterfill

Effects of Weather Conditions on Cooling Unit Operation in a Residence, by H. T. Gilkey and S. Konzo

LONDON LETTER

Commentary on developments in Europe by our correspondent in Great Britain

THERE are many biological processes, wrote the Director of the Water Pollution Research Laboratory in an annual report a few years back, which would benefit from a modest increase in temperature; it was therefore undesirable that power stations should continue to waste in their cooling water such a large proportion of the heat in the coal they burn, so warming up the rivers. The Minister of Housing and Local Government set up a committee to investigate the effects of heated and other effluents on the condition of the River Thames. The Rivers (Prevention of Pollution) Act 1951 included heat among the pollutants that River Boards may regulate the discharge of, and anglers dug up some old Court decisions which give the owner of part of a river bank a cause of action at common law if anyone upstream of him alters the natural flow, e.g., by heating. There was no doubt about it; something just *had* to be done to make use of waste heat from power stations.

The Battersea Pimlico Scheme

One of the biological processes in which low-grade heat can be usefully employed is the Housing of Humans. London had been much destroyed by bombing and there was extensive rebuilding. Battersea Power Station was the obvious choice as guinea-pig because, for one reason or another, it is far and away the best-known power station in Britain. So when the Westminster City Council proposed to develop an area of 33 acres in Pimlico, just across the river from Battersea, in flats to house 11,000 people, a district heating scheme was planned. Combination with power generation has obvious fuel economies, besides eliminating from the housing estate the fuel stores, boiler house and chimney.

The electricity people co-operated, and the whole scheme had now been working long enough for a preliminary assessment to be made. It was described in some detail in a paper by Bryan Donkin, A. E. Margolis and C. G. Carrothers to the Institution of Civil Engineers, published in Part I of their 1954 Proceedings. It was also described, briefly, in a letter to The Times by Mr. (now Sir) Oliver Lyle as a perfectly good district heating scheme spoiled by being connected with a power station. A few years ago Lyle wrote a book called The Efficient Use of Steam, published by Her Majesty's Stationery Office, which has deservedly had a world-wide circulation. He is a staunch supporter both of district heating and of the use of steam for combined power-generation and process heating. He applies these principles very successfully in his sugar-refining factories. His criticism is not lightly to be dismissed, even if it appears to be nonsense.

The facts are that no new boiler plant was installed in the power station but a pair of 1,350 kw back-pressure turbo-generators were put in to use steam from the older boiler plant at 600 psi and 800 deg. Instead of exhausting to condensers cooled by river water the steam from these turbines is condensed at 2 psig in heat exchangers in which water from the district heating system can be heated up to 200 deg. Obviously more electricity can be generated from this steam by passing it through the main condensing turbines, so that it is not economical to feed heat to Pimlico when the demand for electricity is at its peak. Also the maximum heat output possible from the sets is 455 therms per hour, whereas the estimated peak heat demand is 750 therms per hour.

Both problems are overcome by means of a hot-water accumulator. This is designed on similar lines to the one installed by Margolis for the district heating system of

General view of the Pimlico housing estate from the south bank of the Thames. Flats accommodate 11,000 people. The cylindrical heat accumulation is clearly shown. Photo courtesy *Proceedings Inst. Civil Engineers.*

Hamburg which is successfully operated from the Tiefstack Power Station of the Harmburgische Electricitätswerke. The photograph on opposite page, taken by Messrs Kennedy and Donkin, who engineered the scheme, is a general view of the housing estate, and the large cylindrical heat accumulator is shown. This has an internal diameter of 29 ft, a height of 126 ft and a volume of 80,000 cu. ft. It is a remarkable fact that, with an 80 deg differential, more heat can be stored in water (5000 Btu per cu. ft.) than in city gas (500 Btu per cu. ft.). When allowance is made for the fact that the heating value of the gas cannot be used with 100% efficiency, the difference is even more striking.

After being heated in the power station the water, containing a little fluorescein to aid in detecting leakage, passes through pipes in a tunnel under the River Thames which was already in existence for carrying water mains. There is a temperature-control substation, in telephonic communication with the power station, near the heat accumulator, and the operator has indications of temperature in twelve selected rooms, in the mains, and at various levels in the accumulator. When heat supply exceeds demand, hot water runs in at the top of the accumulator and cold water is drawn from the bottom; when the demand increases the opposite occurs, the hot water floating on top of the cooler water, and the accumulator acting as an expansion tank for the whole system.

The flow to and from the blocks of flats is operated with a differential of 60 deg. This is more than is usual for forced circulation systems, but has advantages in keeping down pumping costs and in giving suitable temperatures for the separate control of hot tap-water and space heating. The cost to the flat-dwellers is on a fixed scale, e.g., 9s.5d. per week for a flat of three rooms plus kitchen and bathroom. This should be considered as equivalent to about 3 dollars a week, and does not appear to us to be cheap. In fact, it shows no economy over the unplanned mixture of coke boiler, open fires and electric space heating in your Correspondent's own home; and yet there are doubts as to whether the charges are high enough to cover expenses. Officers of the Electricity Authority talk of the scheme in tones of no-enthusiasm, and it is certain that no worth-while profits are being made.

Individual Flat Metering

One great difficulty is that people will not agree to pay more for their heat than what it would cost by traditional methods, whatever the convenience that is promised; but once they are in, and can use as much heat as they like, their consumption is far higher than it would be if they were charged pro rata. The experiments at Melun in France (see Jan., 1954, *London Letter)* showed this quite clearly; and when it comes to being comfortable with cheap heat it seems that both the French and the English are more like Americans than they would admit. One method that can be used to keep down fuel consumption in a block of flats is, of course, to operate manually on a complaints basis. If there are no complaints of being too cold, then heat is being wasted. Nobody complains if it is too warm—they just open the window. The human thermostat can be set at, say, one grumble per week. Each complaint must be investigated by installing thermometers to prove it is warmer than it feels, and in genuine cases an adjustment is made in radiator size or hot water flow.

The French have a more logical approach. Fournol and Lacroix, in a three-part article in Nos. 17, 19 and 20 of *Cahiers du Centre Scientifique et Technique du Batiment,* have gone thoroughly into the question of measuring the individual heat consumption of apartment dwellers. Their paper is being published in condensed translation in the *Industrial Heating Engineer* (Great Britain), beginning with the current issue. They consider the problem to be chiefly important in connection with hot water systems of heating, whether radiant panels or visible structures such as radiators and convectors are used. Warm air systems are not now much used, and steam systems either have radiator surface temperatures that are too high or (vacuum systems) are too expensive.

The essence of a hot-water system is that both the temperature and the circulation rate of the water can be varied independently, and the authors will have no truck with any metering system which does not permit this. In consequence, a true metering system must measure simultaneously the water flow and the temperature difference between flow and return, multiply them together and intergrate the result with time. And it must do this without preventing the apartment dweller from turning off some radiators and so saving money.

Metering is not an end in itself, nor can one directly save fuel simply by measuring the consumption. The purpose is to make it possible for the individual to adjust his comfort to his pocket, to give him a cash reward for saving fuel.

More than one meter per flat is unthinkable. Therefore, if a heat meter in the strict sense is to be used, all the water for a particular flat must flow through one channel to enable it to be measured. This means a much more costly piping system than would normally be installed in a large apartment building, since each flat must have a separate circuit. To achieve the desired objects of metering, however, any fair indication of proportionate heat consumption will serve, and strict measurement of Btu is unnecessary.

The Societé Européenne pour l'Industrie et le Commerce (SEPIC) has found a workable solution. It was described by J. Topart in *Chauffage-Ventilation-Conditionnement* (**30,** *9,* **44**). The meter is somewhat similar to that used for measuring the consumption of electricity, except that it operates on a low voltage of the order of 6 volts. The rotating disc can be adjusted so that one revolution is equivalent to 1 calorie (4 Btu), and the five dials can be made to read in thousands for the lowest and tens of millions for the highest. An apartment using up to 10,000 cal per hr (40,000 Btu per hr) can thus have at least a year's consumption recorded on the dials before they start again at zero.

There is no need for any special piping arrangements. The detecting device is a temperature-sensitive resistance attached to the surface of each radiator and connected back to the meter by a simple pair of wires. All resistances are in parallel, small radiators having larger resistances (and therefore a smaller effect) than larger ones. This system of resistances is compared electrically with a fixed resistance inside the meter.

It was first proposed to make a genuine attempt to measure Btu by comparing radiator temperatures with the ambient temperature in each flat, using a similar temperature-sensitive resistance. But it was realized that an

(*Concluded on page* 170)

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

THE problem presented for discussion in this issue is not an uncommon one. Many have had to face situations that resulted from the corrosive characteristics of water and the annoyance of red water. A very complete discussion is made available.

Should you have a problem that you would like to have treated in this department, or if you have some comments that you would like to add to the coming discussion, please write to the Editor.

Conducted by
NATHAN N. WOLPERT
Associate Editor

This Month's Problem

I would appreciate any information regarding a chemical or additive which can be added to the water line in a building which serves drinking and lavatory fixtures, which will inhibit rust, stop corrosive action, and seal off any pin holes that are about to form in an old galvanized pipe water line. Lots of these pipes are in concrete and cannot be replaced without great expense. The same condition exists with the steam lines of black iron pipe in the heating system of this building.

Discussions by Readers

The difficulty experienced in the water line serving drinking and lavatory fixtures is due to corrosion occuring in this line. The principal factors influencing the corrosion of ferrous metals are the characteristics of the water, the rate of flow and contact with dissimilar metals. In the particular system described, it is believed that the corrosive characteristics of the water would be the principal cause of the difficulty.

Several variables control the corrosive characteristics of the water, the most important of which are dissolved oxygen and carbon dioxide concentrations. The pH value of the water is also a factor since pH is directly affected by the carbon dioxide concentration. Increased dissolved solids, particularly chloride and sulfate, serve to further the corrosive effect of dissolved oxygen and carbon dioxide.

The attack of dissolved oxygen on ferrous metals causes corrosion and pitting. Generally oxygen-attack produces corrosion in the form of pits and depressions. As attack continues, the pit increases both in area and in depth, and the nodule of corrosion products becomes enlarged. This localized form of corrosion is more severe than would be the case if a general wastage of the metal occurred, at the same corrosion rate, over a large area. Centralizaion of corrosion at points of pitting permits deeper penetration of the metal and more rapid failure at these points.

The chief source of dissolved oxygen in the water is due to contact with the atmosphere. Thus, while water from deep wells is usually devoid of oxygen, surface water supplies are saturated with dissolved oxygen. The solubility of oxygen in the water depends upon the temperature and the atmospheric pressure. An increase in temperature lowers solubility of oxygen while increased pressure increases oxygen solubility.

The rate of corrosion also increases with an increase in temperature. Figure 1 shows accelerated corrosion at 90F and 120F in comparison with 48F for various oxygen concentrations. An increase in the rate of flow also tends to increase the rate of corrosion. At high flow rate, however, this influence is less marked.

The tendency for a water to deposit or dissolve calcium carbonate can be developed from Langelier's equation for the pH of saturation of calcium carbonate. This equation takes into consideration such readily obtained analytical values as pH, calcium, total alkalinity, dissolved solids and temperature. From the value of the pH of saturation (pH_s) of calcium carbonate, the saturation index may be obtained. By definition, the saturation index is the algebraic difference between the actual pH value of the water and the pH of saturation (pH_s) of calcium carbonate, as calculated from Langelier's equation. (Saturation Index = $pH - pH_s$).

The saturation index shows qualitatively the tendency for deposition or solution of calcium carbonate. A positive saturation index will indicate a tendency for deposition of calcium carbonate. A negative saturation index will indicate a non-saturation condition with respect to calcium carbonate and hence a tendency to dissolve any existing calcium carbonate. A "zero" saturation index denotes that a water is exactly at equilibrium with respect to calcium carbonate.

The saturation index can be used as a guide in the controlled deposition of calcium carbonate scale. If such a scale can be deposited uniformly over the metal sur-

Problem for the Next Issue

In planning the heating of a building entrance to a combined office and industrial building, how do you figure the heating of the floor entrance? This building has an entrance with double doors, and then five steps leading up to a foyer where there is a receptionist's desk. Hot water is used for heating.

faces throughout the system, it will act as a physical barrier preventing contact of the water with the metal surface. The corrosive oxygen content of the water, therefore, cannot attack the metal and corrosion is prevented. However, where the protective layer of calcium carbonate is not continuous over the entire surface, the dissolved oxygen present in the water will readily attack the metal surface and corrosion will occur.

In order to develop the positive saturation index required for deposition of calcium carbonate, it is necessary to adjust the pH, alkalinity or calcium content of the water so as to raise the actual pH value slightly above the calculated pH of saturation (pH_s). Soda ash, caustic soda or lime may be used for this purpose.

While it is theoretically possible to control the deposition of calcium carbonate scale to such a point that protection against corrosion is provided, the scale film must be sufficiently thin to be non-objectionable. Such a treatment method, however, is more theoretical than practical, particularly where different temperatures exist throughout the system. If the calcium carbonate balance is so set that only a small amount of deposit will form at the higher temperature in the system, none will form at the lower temperature and protection against corrosion will not be provided at that point. It is difficult to control calcium carbonate deposition to such an exact point as to provide protection from corrosion even in a small system where increases in temperature are not commonly encountered.

Inhibitors may be employed in correcting the problem of corrosion in cold water lines. The use of corrosion inhibitors, however, is actually an indirect method of attacking the problem since such materials function by forming a protective film on the metal surfaces. The film thus formed serves to protect the surface from attack by dissolved oxygen. Both the polyphosphates and the silicates have been employed for this purpose in domestic systems.

Surface active phosphate, such as the crystalline and glassy polyphosphates, have the power to minimize corrosion. Polyphosphates are widely used in treatment of municipal distribution systems where good results are obtained with the feed of as litle as 2 ppm polyphosphate. These materials are quite effective in reducing tuberculation in distribution lines and in minimizing troubles due to red water. The ability of the polyphosphate to form complexes with the iron naturally present in the water, or the iron resulting from corrosion, results in the retaining of iron in solution and thus the prevention of red water difficulties. However, these results are obtained without any appreciable reduction in the overall corrosion rate.

Attempts have been made to use higher concentrations of complex phosphate which are required to keep corrosion down to a minimum. The amount of polyphosphate that may be used in a system is restricted by the limited solubility of tricalcium phosphate. Where water is retained in a recirculating hot water system for relatively long periods of time at high temperatures, such as 160F and above, the polyphosphate will revert to the orthophosphate form and tricalcium phosphate will be precipitated.

Because of the toxicity restrictions placed on the use of inhibitors in water used for domestic purposes, the most effective combination of inhibitors cannot be employed. In industrial water once-through systems, very low concentrations of polyphosphate and chromate have proven highly effective in preventing corrosion and pitting. Good results have also been obtained with the use of low concentrations of polyphosphate and organic, such as a lignin or tannin.

Sodium silicate has been used for the reduction of corrosion in domestic systems. Silicates develop a minor degree of corrosion inhibition by forming a protective film over the metal although silicates are not, in the true sense of "surface active" agents. By definition, surface active agents possess the property of preventing crystal growth or scale formation from a solution that is oversaturated with respect to scale forming salts. The mechanism of silicate film formation is believed to be by the development of an insoluble adherent deposit on the metal. Sodium silicate has been recommended as a corrosion inhibitor primarily for the treatment of relatively soft waters and feed is based on increasing the silica content of the water by 8 ppm as SiO_2. Sodium silicate is available in different grades with varying ratios of Na_2O to SiO_2 and consequently varying alkalinity. The alkalinity supplied by sodium silicate is undoubtedly useful in neutralizing carbon dioxide and in increasing the pH value. Red water difficulties can be reduced by the use of sodium silicate; however, the manner in which the silicate functions is not entirely clear.

While the inhibitors mentioned have generally been employed to minimize corrosion in domestic systems, others are available that may prove more satisfactory under the particular conditions of operation. Direct removal of dissolved oxygen by chemical means may be obtained by the feed of a sodium sulfite to which suitable catalyst has been added to permit removal of dissolved oxygen at cold water temperatures. In any case, however, it is advisable that the problem be studied closely so that the most economical and efficient correction may be obtained under the existing conditions.

The condition described in the second part of the question is the result of corrosion due to dissolved oxygen or carbon dioxide. It may also be due to the presence of both these gases.

When dissolved oxygen is present in the feedwater entering the boiler, it flashes over with the steam and is thus permitted to give rise to corrosion and pitting in the steam and return lines. Dissolved oxygen may be removed from the system by good feedwater deaeration followed by the feeding of a chemical deaerant, such as sodium sulfite.

The sodium sulfite should be fed to the feedwater system at a point that will provide the greatest possible reaction time for the reaction between dissolved oxygen and sodium sulfite. Where a deaerating heater or an open feedwater heater is employed, the solution of sodium sulfite is generally fed to the storage section of the heater. Where a heater is not employed and cold makeup water enters the condensate receiver, the solution of sodium sulfite should be fed at the discharge from the receiver. Maintaining excess sulfite residuals in the boiler water will then serve to assure the elimination of the last traces of dissolved oxygen and prevention of corrosion due to this gas.

When the proper steps are taken to eliminate dissolved

oxygen, then the chief source of the corrosion in the return lines will be due to carbon dioxide. The presence of carbon dioxide in the steam is not prevented by deaeration of the boiler feedwater. While any free carbon dioxide (gaseous carbon dioxide dissolved in water) present in the feedwater is completely eliminated by efficient feedwater deaeration, the carbon dioxide present in the steam and which eventually becomes the chief factor in return line corrosion is that quantity of carbon dioxide produced by decomposition of bicarbonate and carbonate alkalinity of the boiler feedwater. Upon entering the boiler, the bicarbonate content of the feedwater breaks down under the higher boiler water temperatures, liberating carbon dioxide gas in accordance with the following reaction:

$$2NaHCO_3 + \text{Heat} = Na_2CO_3 + H_2O + CO_2$$

Sodium Bicarbonate + Heat = Sodium Carbonate + Water + Carbon Dioxide

In this reaction, carbon dioxide is evolved and the bicarbonate is broken down to carbonate. This carbonate, together with any naturally present in the feedwater also undergoes decomposition as follows:

$$Na_2CO_3 + H_2O + \text{Heat} = 2NaOH + CO_2$$

Sodium Carbonate + Water + Heat = Sodium Hydroxide + Carbon Dioxide

These decomposition reactions show the source of the carbon dioxide content of the steam. At points of condensation in the system, the condensate becomes acidic due to the presence of carbon dioxide which forms carbonic acid in the presence of moisture. Corrosion will occur under these conditions and such corrosion is principally in the form of grooving of the lines. This may be distinguished from corrosion due to dissolved oxygen which manifests itself principally in the form of pitting, and therefore, can be detected.

It can be understood that in order to minimize return line corrosion, it is advisable to reduce the carbon dioxide content of the steam to a value as low as possible. This may be done by acid treatment of the feedwater so as to lower the bicarbonate alkalinity to a satisfactory level. A range of approximately 5 to 10 ppm alkalinity has generally been found to be suitable. Following acid treatment, however, it is necessary to aerate the water in order to expel the carbon dioxide gas produced in the reaction. This method of treatment requires close control and the installation of special feeding equipment, piping and materials of suitable construction.

The condition of return line corrosion may also be corrected by the feed of proper chemical agents to the system. In general, these chemical agents are classified as neutralizing amines and filming amines. The neutralizing amines include cyclohexylamine and morpholine. These volatile amines are fed to the boiler feedwater system and on entering the boiler they volatile with the steam and combine with the carbon dioxide in the condensate to neutralize its acidity. Unlike ammonia, these amines, when used in low concentrations, are not corrosive to copper and zinc bearing metals.

While satisfactory reduction of carbon dioxide corrosion is obtained with the neutralizing amines, they provide no protection against oxygen attack should this gas also be present. Since these amines function by neutralizing the acidity of carbonic acid, where high concentrations of carbon dioxide are present, relatively high amounts of the amine will be required.

The filming amines function by laying down on the metal surface an impervious non-wetting film that will act as a barrier between the metal and corrosive condensate. With this method of treatment, protection is provided against attack by both carbon dioxide and dissolved oxygen. Examples of amines used for this purpose are octadecylamine, hexadecylamine and dioctadecylamine. Unlike the neutralizing amines, it is not necessary to feed the filming type amines in direct proportion to the amount of carbon dioxide present. Consequently, except at low carbon dioxide concentrations, the filming type amine proves a more economical treatment than does the neutralizing amine. For most satisfactory results, however, the filming type amine must be fed in dispersed form directly to the main steam line at a point where it will mix well with the steam. Thus, the feeding of the filming

(*Concluded on page* 174)

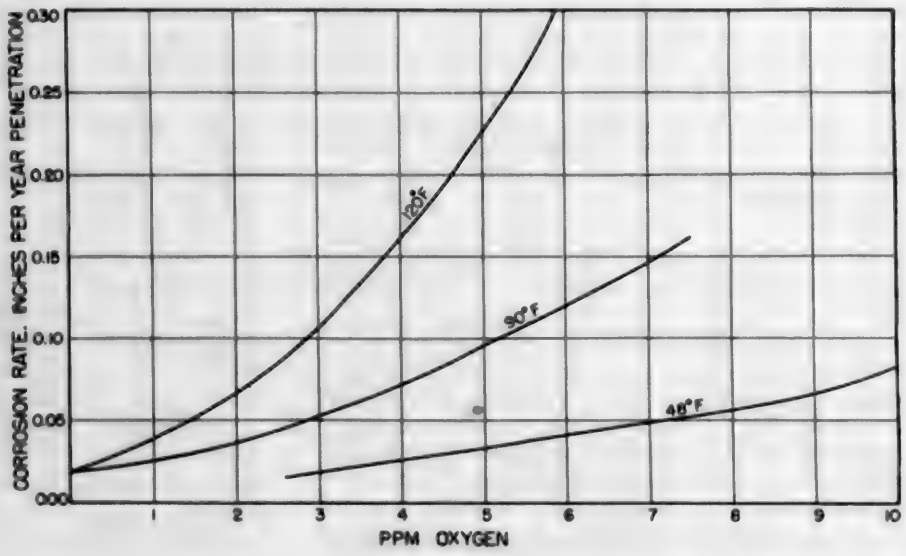


Fig. 1. Yearly corrosion rate in relation to water temperature and various oxygen concentrations.

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Waldorf Ballroom Gets New Coils

PROBLEM: When the original air conditioning system was installed in New York's Waldorf-Astoria over 15 years ago, there was considerable doubt that the Grand Ballroom would ever be filled to capacity. Moreover, such things as television and the tremendous lighting load required for TV productions were not considered. Today, however, hardly a week goes by that the room is not filled with three times the number of people originally planned for, and at least one TV program a week is televised from the Grand Ballroom.

SOLUTION: Fortunately, enough chilled water refrigeration equipment was originally installed to handle the present peak load. To increase the inadequate capacity of the air handling equipment, which was only one-third as great as recent requirements demand, consulting engineers recommended the removal of existing air washers and the installation of banks of chilled water cooling coils with two new blower systems. In addition, the introduction of larger quantities of outside air for ventilation required the use of new banks of preheating and heating coils, using steam from the hotel central heating plant. Coils manufactured by the Typhoon Air Conditioning Company were tailor-made for this job, since standard coils would have been difficult to fit. To prevent excessive pressure drop, a double serpentine coil construction was used. Because of the tremendous quantities of water required, the coils are 8 rows in depth and 10 feet in length. A total of 30 heating and cooling coils were installed for the Grand Ballroom and foyers.

RESULTS: Present capacity of the system is 420 tons, enough to take care of the maximum capacity of 3,000 people. One blower handles the main distribution into the ballroom and west foyer, while other blowers take care of the boxes and balconies in the ballroom and east foyer.

V-Belts Help Air Condition Buses

PROBLEM: Extreme variations in temperature and humidity confront a coast-to-coast network of passenger vehicles. The air conditioning units controlling temperature and humidity of Greyhound coach interiors are built by Tropic Aire, Inc., a subsidiary of McGraw Electric Company. The capacity of the system is 5 tons of standard refrigeration or 60,000 Btu per hour of heat removal under extreme desert conditions. One special problem in designing this system involved providing a V-belt drive from engine to blower with space at a minimum and no practical means of belt take-up.

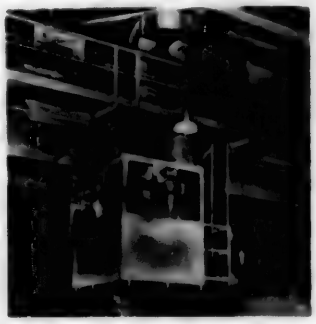
SOLUTION: The problem was solved by Worthington Corp. with a special V-belt drive. The drive consists of a variable pitch driven sheave, a Q-D (quick detachable) driver sheave, and Worthington-Goodyear oil-and-heat-resistant steel cable belts.

RESULTS: The variable pitch sheave provides proper belt tension which is maintained during operation of the unit.

The average bus air conditioning system operates 2,500 hours per season, adjusting to changing loads and maintaining constant temperature and humidity within the coach regardless of outside conditions.

Cooled Crane Cabs End Down Time

PROBLEM: A large steel tube mill was paying excessive operating costs for cranes, especially those located near hot steel pouring operations and steel soaking pits, their operators had to work in very short shifts of less than half an hour. Standby operators were required to watch the chief operator and start rescue work in the event of heat collapse of the operator. Temperatures in the overhead area always range from 140 to 160 deg. F, and when the cab is directly over an opened pit, it is subject to the fumes and direct radiation from the 2300-deg. steel.



SOLUTION: Air conditioned equipment made especially for crane cabs by Dravo Corp. was installed. With this equipment, air supply for the crane cab passes through filters and carbon canisters and is then cooler before entering the cab. Supply and return ducts between cabs and conditioners are insulated. About 25% of the air handled is make-up for cab ventilation. Where special dust problems were encountered, such as on cranes used to charge furnaces, a special bag filter unit was installed ahead of the air conditioner.

RESULTS: Experience with the first conditioning unit proved that its installation cost was returned in less than a year, and steps were taken to equip the remaining cranes in the melting shops with crane cab conditioners. In addition to the dollar savings which were applied against cost of the air conditioned cab, advantages in health and safety of operators were also realized. Improved employee relations was another important factor influencing purchase of air conditioning for cabs throughout the plant. There is no longer need to maintain a constant watch over operators or standby relief men.

Air Channeled Through Perforated Ceiling

PROBLEM: In the engineering design room of the Armstrong Cork Company, Lancaster, Pa., acoustical treatment was to be complete over the whole ceiling and the air conditioning installation was to handle a load imposed by exposure on three sides as well as the roof plus 80 persons and 23,000 watts of electric light in the room.

SOLUTION: The acoustical ceiling was erected by mechanical suspension about 18 inches below the original ceiling. Cool air is circulated into plenum spaces above the acoustical perforated metal pans which are backed by mineral wool pads acting as sound absorbers. Hollow metal air flow channels, 1¼ inches wide by 23¾ inches long, were inserted on the long side of each metal pan and next to the dense mineral wool. The air flow channels are slotted on the plenum side and open to the face of the metal pan, while a wire support holds the acoustical pad about ⅛ inch away from the face of the pan. This permits air circulation behind the acoustical tile ceiling to flow around the wool and out the holes in the tile.

RESULTS: Tiny jets of cool air streaming from perforations in 4700 square feet of ceiling tile are thoroughly dispersed less than an inch from the tile surface. This dispersion makes the interior completely free of draft. An air supply of 10,000 cfm is introduced without discomfort to any of the occupants. Cigarette smoke is quickly dispersed and expansion and contraction of paper due to temperature change has been eliminated.

Glass Foam Withstands Ammonia Leak

PROBLEM: At the Abbotts Dairies, Inc., Philadelphia, Pa., accidental leaks of ammonia refrigerant used in milk storage and ice-cream hardening room cooling equipment had caused organic insulation to deteriorate to the point where structural weakening lead to floor failure.

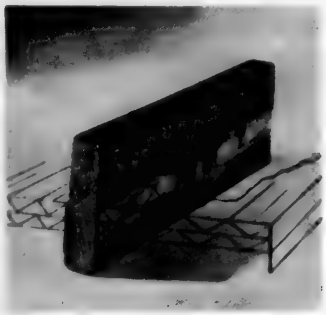
SOLUTION: Ten year's experience with an installation of cellular glass insulation used initally as a vapor barrier for organic insulating material provided the background for selection of Foamglass, product of Pittsburgh Corning Corporation, as replacement material for 15,000 square feet of reconstructed refrigerated space at three milk and ice cream plants. The cellular glass, with a compressive strength of 100 pounds per square inch, was used as a foundation for floors finished with tile or four inches of concrete.

RESULTS: Tile floor in smoke handling rooms can be washed without fear of damage to supporting insulation. Accidental ammonia leaks cause no deterioration. Both maintenance and structural renovation are brought to a minimum.

Aluminum Foils Fire

PROBLEM: In August, 1952, a fire started in the roof area above four clasrooms of the New Bridge Elementary School in New Milford, N. J. It was feared the fire might penetrate to the classrooms below.

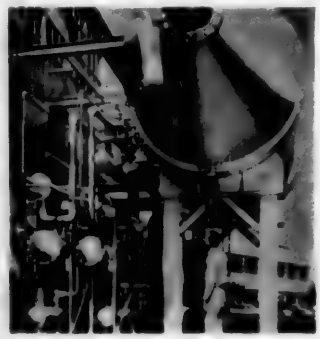
SOLUTION: When the school was built, the architect had specified Infra multiple accordian aluminum insulation Type 6 for installation in the ceiling. This product has a reflectivity of 97 percent and a melting point of 1,220 deg F so that heat from the fire was effectively blocked from penetration to the ceiling below.



RESULTS: When the roof area was being renovated in August, 1953, the ceiling beams were found to have been charred by the fire only above the multiple accordian aluminum insulation. The beams were not charred below the insulation and there was a distinct dividing line between the charred and unburned areas.

Wind Tunnel Uses Cooled Air

PROBLEM: For testing airplanes designed to operate near and above the speed of sound, the National Advisory Committee for Aeronautics constructed one of the nation's largest wind tunnels at its Ames Aeronautical Laboratory near San Francisco. Supersonic air speeds are achieved by an axial flow compressor driven by two motors totaling 60,000 hp. So much energy is expended that the air stream becomes heated and refrigeration must be applied to reduce the air temperature.



SOLUTION: A large shell heat exchanger was provided by Frick Company. Compressed air is cooled and humidity controlled in the shell which is 87 inches in diameter and nearly 25 feet long and arranged with a complete air conditioning system inside. There are 22 sections of cooling coils connected to a two-stage refrigeration system with Frick compressors powered by two motors totaling 225 hp.

RESULTS: By compressing air within the tunnel to 100 or more pounds per square inch, test results on small models are equivalent to those which would be obtained by testing much larger models at atmospheric pressure. Excess heat in the compressed air is removed by refrigeration.

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

PLANT AND PROCESS VENTILATION

Emphasis has been placed on means for estimating the ventilation quantities in various industrial applications in the new book, Plant and Process Ventilation, by W. C. L. Hemeon, engineering director, Industrial Hygiene Foundation. In order to free the engineer from unnecessary detail, the subject of duct design, which is a well understood technique, has been simplified by the condensation of design data.

Data are presented and explained to provide the engineer, as well as the student, with pertient ventilation design factors for any situation that may be found in a plant. This is accomplished by a system of classification that embraces all ventilation situations. For each situation, the principles that apply are clearly set forth and lead to the rules for procedure. The widely recognized design principles which apply to exterior hoods and booths are extended by the fundamental analysis to cover all ventilation and material transport situations.

Three chapters are devoted to fundamentals to establish the groundwork for more advanced information. One chapter is devoted to an entirely new treatment of the dynamics of dust particles.

Concepts of DallaValle and Hatch, two men well known in the ventilation field, have been extended so that it is possible by the simple observation of a process, to estimate accurately the exhaust requirements of a cold, multidirectional process. With an understanding of the subject and with the necessary field data, a designer can refer to tables of a handbook nature which summarize exhaust requirements for such a situation.

Presented for the first time is a theory for estimating air flow induced by motion of solid particles. An example, is falling motion, as in the handling of bulk materials. This theory is based on the calculation of power generation due to the interaction of air friction on falling or projected particles. These relationships are then reduced to graphical and tabular form so they can be applied easily to practical problems. New principles derived by the author are found in the chapter on canopy hoods and exhaust for hot processes. Included is a consideration of the exhaust rates required for enclosures housing heated processes which leads to new equations describing the air velocity through openings that are required to prevent the escape of contaminated hot air.

Mr. Hemeon presents a simplified method, easy to apply, for the design of air injectors, and a new development which enables the design of natural draft ducts to carry away contaminated hot air or gases from canopy hoods and the like.

Also treated is the problem of ventilating large mill buildings that house processes releasing massive quantities of heat into the mill atmosphere. A complete analysis of the behavior of roof ventilators and air currents within the building due to their thermal properties is so presented as to enable the plant engineer to analyze a particular problem and to explain the frequently anamalous behavior of large scale ventilation currents.

Here is a book that is a must for the engineer interested in ventilation. Principles are clearly explained and new information presented, not found in other publications. Engineers will find this a good reference book.

Plant and Process Ventilation, by W. C. L. Hemeon. Cloth bound, 6 x 9 inches, 448 pages. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price, $9.

RADIANT HEATING

The second edition of Radiant Heating by Richard W. Shoemaker has just been published. It contains methods for designing radiant heating systems to meet a variety of requirements.

It has been the objective of the author to present enough information and data to enable an engineer to design a practical radiant installation, including snow melting applications, and the heating of swimming pools.

It has chapters on commercial application, residential application, the radiant heating plant, control systems for radiant heating, design of radiant heating systems, installation of radiant heating systems, radiant cooling including heat pump applications, electrical applications, and the precise method of designing radiant heating systems.

The first edition of this book was printed in 1948.

Radiant Heating, by R. W. Shoemaker. Cloth bound, 6 x 9 inches, 346 pages. Published by McGraw-Hill Book Company, 330 W. 42nd St., New York 36, N. Y. Price, $7.

NATIONAL ELECTRICAL CODE HANDBOOK

Ever since 1932, various editions of the National Electrical Code Handbook have been published to tie in with the latest edition of the code, as a guide for the reader to a ready understanding of the general plan, scope and intent of the National Electrical Code. It presents detailed discussion of individual code provisions to facilitate a better understanding.

The first edition of this book was planned and prepared by the late Arthur L. Abbott. The author of this, the eighth edition, is Charles L. Smith, electrical field engineer of the National Fire Protection Association. The present edition ties in with the 1953 edition of the National Electrical Code.

The book follows exactly the numbering system of the code. Next to the rule, in a contrasting type face for greater ease of reference, is the meaning, intent and interpretation of the rule.

National Electrical Code Handbook, revised by C. L. Smith. Cloth bound, 5½ x 8 inches, 642 pages. Published by McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 36, N. Y. Price, $7.50.

DEGREE-DAYS FOR NOVEMBER, 1954

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

AIR CONDITIONING, HEATING AND VENTILATING'S 27th Year of Publication of Monthly Degree-Day Data

City	November			Season to Nov. 30, incl*		
	1954	1953	Normal	1954-55	1953-54	Normal
Abilene, Texas (A)	275	352	350	374	438	503
Albany, New York (A)	752	681	780	1264	1229	1362
Albuquerque, New Mexico (A)	483	554	630	634	739	858
Alpena, Michigan (C)	770	721	864	1464	1389	1609
Anaconda, Montana (C)	(a)	777	951**	(a)	1417	1933**
Asheville, North Carolina (C)	653	546	552	964	810	864
Atlanta, Georgia (A)	460	365	393	605	464	511
Atlantic City, New Jersey (C)	539	438	507	732	645	766
Augusta, Georgia (A)	419	392	282	562	471	341
Baltimore, Maryland (C)	529	454	489	708	612	725
Billings, Montana (A)	626	639	876	1318	1071	1567
Binghamton, New York (C)	727	650	735	1200	1152	1304
Birmingham, Alabama (A)	418	394	396	576	486	532
Bismarck, North Dakota (A)	850	861	1098	1727	1467	1923
Block Island, Rhode Island (A)	572	490	591	895	816	1009
Boise, Idaho (A)	636	582	762	1212	1032	1286
Boston, Massachusetts (A)	612	487	618	967	835	1010
Bozeman, Montana (C)	(a)	790	1006**	(a)	1448	1993**
Buffalo, New York (A)	693	626	753	1182	1091	1308
Burlington, Iowa (A)	682	646	765	1105	956	1184
Burlington, Vermont (A)	799	676	858	1450	1354	1551
Butte, Montana (C)	(a)	818	923**	(a)	1552	1922**
Cairo, Illinois (C)	466	478	492	679	609	681
Charleston, South Carolina (C)	254	245	214	322	274	248
Charlotte, North Carolina (A)	492	402	438	665	512	592
Chattanooga, Tennessee (A)	528	491	477	736	617	670
Cheyenne, Wyoming (A)	736	775	897	1403	1390	1715
Chicago, Illinois (C)	629	574	696	960	812	1098
Cincinnati, Ohio (C)	540	518	567	801	690	831
Cleveland, Ohio (A)	663	590	699	1036	935	1114
Columbia, Missouri (A)	561	548	654	863	756	978
Columbia, South Carolina (A)	438	302	308	575	358	384
Columbus, Ohio (C)	616	533	654	924	746	1012
Concord, New Hampshire (A)	802	711	849	1446	1355	1568
Concordia, Kansas (C)	523	639	687	532	836	1019
Dallas, Texas (A)	263	314	299	341	368	352
Dayton, Ohio (A)	680	616	693	1051	898	1090
Deer Lodge, Montana (C)	(a)	790	1055**	(a)	1649	2187**
Denver, Colorado (A)	616	649	771	1082	1025	1316
Des Moines, Iowa (A)	669	665	798	1118	969	1252
Detroit, Michigan (A)	705	609	747	1126	976	1224
Devils Lake, North Dakota (C)	944	920	1197	1933	1601	2127
Dodge City, Kansas (A)	498	635	669	812	833	971
Dubuque, Iowa (A)	795	741	882	1363	1183	1475
Duluth, Minnesota (C)	962	932	1092	1991	1718	1983
Elkins, West Virginia (A)	774	787	726	1288	1323	1260
El Paso, Texas (A)	308	329	390	354	415	460
Ely, Nevada (A)	781	809	894	1614	1554	1683
Escanaba, Michigan (C)	793	772	833	1604	1425	1735
Evansville, Indiana (A)	567	573	570	872	805	844
Fargo, North Dakota (A)	906	892	1122	1771	1487	1923
Fort Smith, Arkansas (A)	394	462	435	543	579	575
Fort Wayne, Indiana (A)	720	666	759	1144	1032	1243
Fort Worth, Texas (A)	276	334	299	353	389	357
Fresno, California (A)	372	312	345	454	419	431
Galveston, Texas (C)	80	117	131	99	124	131
Grand Junction, Colorado (A)	669	667	792	1018	985	1161
Grand Rapids, Michigan (A)	746	671	822	1273	1160	1428
Green Bay, Wisconsin (A)	847	763	945	1587	1355	1643
Greensboro, North Carolina (A)	607	489	510	841	659	741
Greenville, South Carolina (A)	510	371	411	676	471	552
Harrisburg, Pennsylvania (A)	670	614	630	991	917	1007
Hartford, Connecticut (A)	694	616	699	1133	1024	1184
Hatteras, North Carolina (C)	269	254	244	327	287	307
Havre, Montana (C)	676	760	1023	1481	1293	1857
Helena, Montana (A)	772	785	999	1744	1447	1936
Houston, Texas (C)	119	138	162	149	153	162
Huron, South Dakota (A)	761	826	975	1431	1267	1596
Indianapolis, Indiana (A)	682	635	705	1055	922	1090
Jackson, Mississippi (A)	321	315	310	437	389	379
Kansas City, Missouri (A)	478	522	621	732	686	905
Knoxville, Tennessee (A)	563	503	498	779	626	710
La Crosse, Wisconsin (A)	803	744	921	1423	1154	1520
Lander, Wyoming (A)	772	825	1050	1519	1421	1926

(a) Data not available.
*Heating season, cumulative, from Sept. 1.
**Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company. Tacoma figures through the courtesy of the Tacoma News Tribune.

[Table concluded on opposite page]

Degree-Days for November, 1954 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 27th Year of Publication of Monthly Degree-Day Data

City	November			Season to Nov. 30, incl*		
	1954	1953	Normal	1954-55	1953-54	Normal
Lansing, Michigan (A)	(a)	679	813	(a)	1188	1408
Lewiston, Maine (O)	825	771	876**	1514	1511	1542**
Lincoln, Nebraska (C)	589	670	741	973	925	1130
Little Rock, Arkansas (A)	362	415	405	504	501	525
Livingston, Montana (C)	(a)	682	864**	(a)	1280	1614**
Los Angeles, California (C)	81	97	140	111	115	198
Louisville, Kentucky (A)	559	552	579	852	753	862
Lynchburg, Virginia (A)	630	504	531	895	696	816
Macon, Georgia (A)	360	329	280	474	388	343
Madison, Wisconsin (C)	782	711	864	1321	1128	1420
Marquette, Michigan (C)	808	760	933	1689	1398	1712
Memphis, Tennessee (A)	431	433	432	595	548	575
Meridian, Mississippi (A)	350	349	336	485	429	428
Milwaukee, Wisconsin (A)	736	682	831	1223	1101	1393
Minneapolis, Minnesota (A)	795	767	960	1483	1180	1576
Moline, Illinois (A)	722	660	786	1175	1021	1245
Montgomery, Alabama (A)	360	319	304	467	379	373
Nantucket, Massachusetts (A)	568	505	615	957	898	1098
Nashville, Tennessee (A)	498	502	471	728	632	647
New Haven, Connecticut (A)	651	610	663	1042	993	1119
New Orleans, Louisiana (C)	150	125	141	183	142	146
New York, New York (C)	569	458	561	826	665	863
Newark, New Jersey (A)	601	523	603	888	763	951
Norfolk, Virginia (A)	442	403	408	591	508	569
North Platte, Nebraska (A)	737	819	846	1312	1260	1391
Oak Ridge, Tennessee (C)	599	558	(a)	845	713	(a)
Oakland, California (A)	282	278	336	476	482	569
Oklahoma City, Oklahoma (A)	392	443	459	545	575	620
Omaha, Nebraska (A)	575	620	783	970	869	1202
Parkersburg, West Virginia (C)	(a)	593	600	(a)	858	928
Peoria, Illinois (A)	689	654	759	1069	947	1184
Philadelphia, Pennsylvania (C)	554	464	516	770	625	768
Phoenix, Arizona (A)	39	148	182	53	159	195
Pittsburgh, Pennsylvania (C)	615	534	612	030	915	966
Pocatello, Idaho (A)	739	678	873	1488	1213	1543
Portland, Maine (A)	785	708	825	1464	1395	1539
Portland, Oregon (C)	452	420	534	834	716	899
Providence, Rhode Island (A)	658	570	672	1060	1028	1160
Pueblo, Colorado (A)	609	638	771	978	967	1228
Raleigh, North Carolina (A)	530	395	387	732	500	515
Rapid City, South Dakota (A)	665	691	891	1337	1096	1584
Reading, Pennsylvania (C)	630	571	588	918	815	930
Red Bluff, California (A)	364	331	319	438	414	378
Reno, Nevada (A)	700	675	744	1387	1227	1352
Richmond, Virginia (A)	561	488	498	786	668	741
Rochester, New York (A)	701	624	759	1217	1143	1332
Roswell, New Mexico (A)	437	480	501	607	645	665
Sacramento, California (C)	378	302	321	459	388	413
St. Joseph, Missouri (A)	566	595	600	878	830	882
St. Louis, Missouri (C)	521	473	570	790	626	810
Salt Lake City, Utah (A)	622	560	771	1114	929	1240
San Antonio, Texas (A)	142	198	201	171	213	226
San Diego, California (A)	64	86	147	99	104	223
Sandusky, Ohio (C)	670	560	684	1004	862	1077
San Francisco, California (C)	245	242	237	477	453	475
Sault Ste. Marie, Michigan (A)	858	793	1005	1802	1611	1942
Savannah, Georgia, (A)	328	291	225	435	336	263
Scranton, Pennsylvania (C)	702	644	693	1139	1077	1197
Seattle, Washington (C)	404	454	540	882	836	1003
Sheridan, Wyoming (A)	693	765	957	1450	1299	1774
Shreveport, Louisiana (A)	285	328	305	366	382	358
Sioux City, Iowa (A)	661	730	885	1170	1080	1418
Spokane, Washington (A)	696	733	879	1496	1291	1592
Springfield, Illinois (A)	658	559	666	1023	768	981
Springfield, Missouri (A)	529	548	615	808	736	925
Syracuse, New York (A)	717	626	714	1186	1129	1227
Tacoma, Washington (C)	428	476	579	932	890	1131
Terre Haute, Indiana (A)	(a)	635	681	(a)	906	1053
Toledo, Ohio (A)	717	647	756	1149	1039	1245
Topeka, Kansas (C)	487	544	630	755	716	914
Trenton, New Jersey (C)	611	535	582	900	789	922
Tulsa, Oklahoma (A)	367	433	462	502	549	632
Utica, New York (O)	757	665	781**	1313	1216	1393**
Valentine, Nebraska (C)	691	726	891	1337	1124	1497
Walla Walla, Washington (C)	464	546	675	930	833	1076
Washington, D. C. (C)	567	488	510	793	644	773
Wichita, Kansas (A)	467	542	597	693	700	848
Williston, North Dakota (C)	776	815	1101	1683	1426	1967
Winnemucca, Nevada (A)	766	707	822	1565	1321	1510
Yakima, Washington (A)	635	701	807	1336	1204	1403

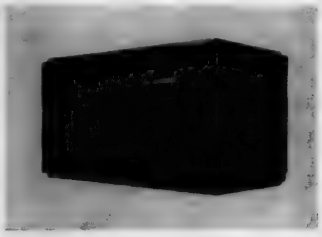
For footnotes, see page 128.

NEWS OF EQUIPMENT AND MATERIALS

Use the handy prepaid postcard, page 148, for securing additional information on items described in this department.

Two Units Added to 1955 Line

Two products are announced by Janitrol Div., Surface Combustion Corp., Columbus, Ohio, for addition to its 1955 line of Janitrol heating and air conditioning equipment. The units are a down-flow, gas-fired winter air conditioner and a horizontal summer air conditioner.



The manufacturer states that the down-flow furnace is designed to meet the growing demand for perimeter-type heating in basementless homes with either slab or crawl-space construction. The unit features Multi-thermex heat exchangers and ribbon flame burners. The blower is sized for either conventional or small duct systems. The gas-fired down-flow will be available in 80, 100 and 120,000 Btu per hr input sizes.

The horizontal cooling unit (shown) will provide more flexibility and space-saving for summer conditioning installations. Its compact size makes it particularly adaptable for attic or crawl-space locations. The unit, available in two-and three-ton capacities, is designed for application with a separate blower.

More information? Circle Item 1 on postcard page 148.

Pressure Regulating Valves

Production of a crank case pressure regulating valve in 1½ and 3 ton sizes is announced by A-P Controls Corp., Milwaukee, Wis.

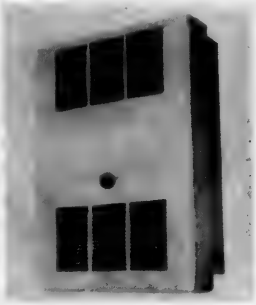
These valves (Model 237) protect the compressor motor against overload and possible burnout caused by high torque loads due to excessive suction pressure. At high suction pressure load, the valve will protect the motor by pressure regulation of refrigerant gas to the compressor inlet. Only a safe back pressure is allowed to develop, and by modulating action, the valve will vary the flow to maintain the pressure limit setting. The pressure range is adjustable and can be fixed at a point between zero to forty lb gage.

Standard connection sizes in the 1½ ton valve are ⅝-inch SAE male flare, ⅝, ⅞, and 1⅛-inch OD solder. The 3 ton valve connection eyes are 1⅛ inches and 1⅜ inches OD solder.

More information? Circle Item 2 on postcard, page 148.

Wall Unit Heats, Cools

A hot and chilled water heating and cooling system providing year-round air conditioning has been developed by Heating and Cooling Div., Union Asbestos & Rubber Co., Chicago, Ill.



Called the Dual-Vector, the unit can be used with existing radiator heating as well as in new buildings. Forced hot water circulated through the unit furnishes heat in winter and chilled water circulation provides air conditioning during the summer.

A unit fan control gives individual room temperature and humidity capacities, which can be operated either thermostatically or by manual settings. In this way, only rooms actually in use need be heated or cooled, which the company states, results in a substantial saving in operating cost to the user. The unit can be installed between the studding, and its small size takes up a minimum of wall space. The units are used in series and are designed for use with one or two-pipe systems.

More information? Circle Item 3 on postcard, page 148.

Electric Water Heater

A Toastmaster automatic electric gas water heater is introduced by Clark Div., McGraw Electric Co., Chicago, Ill. The unit, called the Commander Model, is of internal flue design.

The unit is equipped with Grayson controls, and top and sides are insulated with a blanket of Fiberglas. Manufactured in 20, 30, and 45 gallon capacities, the unit is designed for heavy duty service, and is covered by a ten-year warranty.

More information? Circle Item 4 on postcard, page 148.

ASME Rated Relief Valve

The addition of an ASME rated pressure relief valve to its line is announced by Bell & Gossett Co., Morton Grove, Ill.

The valve is called the No. 750 and has a relieving capacity of 750,000 Btu per hr. The unit employs a silicon disc seat. The manufacturer states that thorough tests have proven this material to be impervious to excessive temperatures and but a very small pressure differential is required to close the valve after pressure is relieved. The possibility of steam flash is thus eliminated and positive seating insured under all conditions.

More information? Circle Item 5 on postcard, page 148.

Motors Are Explosion Proof

Explosion-proof Tri-Clad 55 motors, featuring extra protection for hazardous-location applications, are announced by Small Integral Motor Dept., General Electric Co., Schenectady, N. Y. Available in ratings from one to five horsepower, this addition to the company's line of NEMA rerated motors is designed for safe applications in classified atmospheres containing flammable gases or combustible dusts.

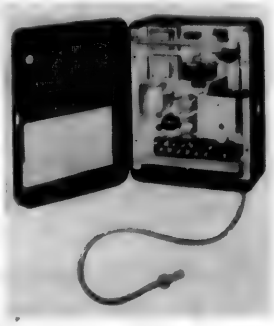
The motor has heavier frame and end shield castings, and a machine-fit conduit box secured to the frame with four bolts. The end shields are fastened to the frame with external bolts to avoid a flame path to the interior of the motor. The cooling fan is made of a Textolite plastic so that there will be no danger of the fan striking a spark.

Up to the present time, the company's standard explosion-proof motors in these ratings had Underwriters' Laboratories approval for use in atmospheres containing gasoline, petroleum, naphtha, alcohols, acetone, solvent vapors, natural gases, coal dust, coke dust, and grain dust. In addition to these, the company claims that the explosion-proof motors can be used in atmospheres containing metal dusts, magnesium, and aluminum. The classes covered under the National Electrical Code are: Class I, Group D; and Class II, Groups E, F, and G. Due to extra weight of these heavy-duty motors, a lifting ring is provided in all frame sizes.

More information? Circle Item 6 on postcard, page 148.

Combustion Control System

Protection against explosion hazards of burning fuel is offered to users of light oil, gas, and combination light oil/gas burners by the Fireye Combustion Control System FJ-2 announced by Combustion Control Div., Electronics Corp. of America, Boston, Mass.



Employing the flame-sensitive Firetron Cell, the system visually monitors oil and gas, main and pilot flames, and shuts off all fuel two to four seconds after the flame goes out. The system automatically programs the startup, operating, and shutdown cycles of the burner, permitting unattended operation. On piloted burners, it does not allow the main fuel valve to open until the pilot flame is established. Where direct electric spark ignition is used, the programming control provides a five second trial-for-ignition period. The control cycles each time operating or limit control closes but must be manually reset following flame failure. It includes a safe-start feature whereby component failure or the presence of flame prior to startup will prevent burner operation.

More information? Circle Item 7 on postcard, page 148.

Universal Flow Check Valve

A new universal type flow check valve has been introduced by Taco Heaters, Inc., Cranston, R. I., which the manufacturer claims is the first significant change in valves for this application since the introduction of forced circulation hot water heating.

This new valve, the Universal Flochek, is suitable for either angle or horizontal application. What it actually means is that the heating contractor or wholesaler needs to stock only one valve instead of two, thereby reducing his inventory by half.

From the contractors' standpoint, he always has the right valve regardless of the conditions found on the job.

Another feature the heating contractor will find useful is the additional connection on a horizontal application for a by-pass between the return and supply. The use of this by-pass reduces expansion noises appreciably.

Other features include: working parts easily removable for cleaning; all working parts are bronze, brass or stainless steel; high ratio weight disc to seat to prevent leakage; electrically lapped bronze disc, and heavy brass seat, precision ground.

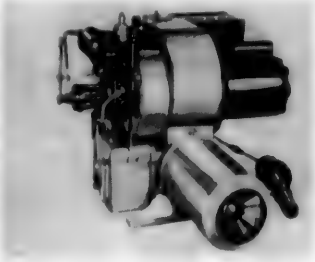
The valve is available in 1, 1¼ and 1½ inch sizes.

More information? Circle Item 8 on postcard, page 148.

Addition to Oil Burner Line

The introduction of its No. 3 Hev-E-Oil burner is announced by Cleaver-Brooks Co., Milwaukee, Wis.

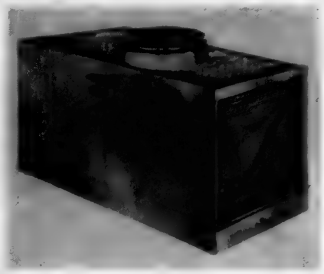
The manufacturer states that the unit is especially suited for installation in small commercial, industrial and institutional buildings up to installations having a net standing radiation of 3,800 sq ft or 35 boiler hp. The capacity of this burner has been increased 56% over previous models so that it is capable of burning 11 gallons of oil per hour. The burner is a low pressure air atomizing type with all electric ignition. It is designed to burn No. 4 or No. 5 heavy oil without pre heating. The unit is a complete package ready to be installed with a boiler or heating plant. It is completely wired and ready for service connections. An easily accessible control box is mounted on the burner, housing all electrical controls. No front plates, secondary air door or checker work hearth is needed with this unit, all primary and secondary air is furnished by the burner. The correct amount of oil and air is dispensed by an air/oil metering pump. Oil burners are fire tested in the factory and meet the requirements of the Underwriters' Laboratories.



More information? Circle Item 9 on postcard, page 148.

Double-Flow Tower Introduced

With the introduction of its packaged steel double-flow Aquatower, The Marley Company, Kansas City, Mo., has expanded its packaged Aquatower line to accommodate water cooling jobs from 2 to 100 tons. This addition to the line is designed for water cooling loads in the 60 to 100 ton range. Although designed primarily for air conditioning and refrigeration applications, the double-flow tower is suitable for industrial water cooling.



The tower is factory assembled in three sub-assemblies which can be safely shipped, easily hoisted and quickly assembled in the field. This line is equipped with the company's multi-blade, cast aluminum, adjustable pitch fans with V-belt drive; casing and basins are fabricated from heavy gage steel. Interior surfaces are protected with corrosion-resistant Marmastic. Exterior is painted with zinc chromate primer and a heavy coat of aluminum paint. Other design features include self-cleaning cold water basin, nail-less filling, and simplified piping and grilling requirements.

More information? Circle Item 10 on postcard, page 148.

Room Air Conditioner Line

An air conditioning unit which can be adjusted to fit flush with the inside wall and thus not bulge out into the room is featured in the 1955 line of room air conditioners manufactured by Major Appliance Div., General Electric Co., Louisville, Ky. The line features cabinets in a blond or mahogany finish, improved appearance in both interior and exterior cabinets, and units which can heat as well as cool.

Flush mount construction, known as Drape-Line Design, is available in the R32M, R52M, and R72M models, including ½ hp, 115-volt and ¾ hp, 115-, 208-, and 230-volt models, and in 1-hp, 208- and 230-volt models. These units can either be installed flush with the inside wall or projected into the room as shown in the illustration. In any position the unit does not interfere with the movement of draperies or venetian blinds. Cooling capacity is not lowered in any way by the flush position. Two-tone finish is utilized on the exterior weatherhood beyond the outside wall with light grey predominating to blend well with exterior decoration. This two-tone combination also de-emphasizes outside projection of the unit. Three rotator air directors are located behind the front grille for adjustment of air direction. The manufacturer claims that design improvement of component parts as well as rubber and spring mountings, and the use of absorbent plastic result in almost noiseless operation. The filter needs no replacing or outside servicing. It can be removed and cleaned with warm water.

All-weather units, which heat as well as cool, are available in ¾ hp and 1 hp, 230-volt models. A reverse flow of refrigerant extracts heat from outside air providing heat without use of heating elements. Since the reverse cycle is effective only when outside air is above 40 deg F, a resistance heating element turns on automatically when outside air drops below this point. The manufacturer states that this gives effective supplemental heating over a full range of outside temperatures.

More information? Circle Item 11 on postcard, page 148.

Flexible Piping Connectors

A standardized line of easy-to-install flexible connectors to control thermal expansion in radiator heating systems is announced by The American Brass Co., American Metal Hose Branch, Waterbury, Conn. The new product, Flex-pipe, consists of seamless flexible phosphor bronze tubing with brass N.P.T. male fittings attached to each end. A wire braid covering adds strength.

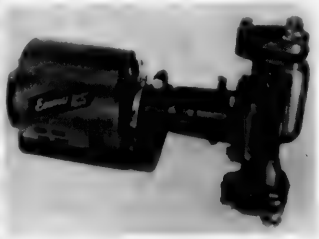
This series of flexible phosphor bronze connectors can be used to dampen vibration; take care of expansion and contraction in risers and supply lines; to connect outlets which do not line up; and to compensate for other piping travel. They are easy to install in cramped spaces.

The assemblies are available in diameter sizes ¼ inch through 1½ inches in overall lengths 8 through 28 inches.

More information? Circle Item 12 on postcard, page 148.

High Head Circulator

A circulator with a head designed for extra power is being produced by Econo Products Co., East Haddam, Conn. This horizontal hot water heating circulating pump called Magic Head is made to deliver maximum power for circulating water in radiant panel heating systems, baseboard systems, and split-level construction where long tubing footage, and numerous fittings and bends put heavy line resistance into the flow of water in the system.

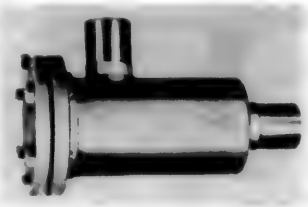


The design incorporates an Open Fin Power Pellor coupled with oversized waterways which it is claimed gives extra power and capacity for the pump to operate at sustained head pressures without overloading the motor. The circulator also features an instantly adjustable head assembly which can be rotated to any angle for any direction of flow, vertical, horizontal or other. The pump is completely cushioned from the heating system by Neoprene vibration dampeners and gaskets. The pump also features full power custom designed motor with built-in overload protection and oversized bearings.

More information? Circle Item 13 on postcard, page 148.

Strainer Line Is Introduced

A line of strainers is offered by Detroit Controls Corp., Detroit, Mich. These line strainers are designed to protect valves and pumps in all fluid systems; for refrigeration applications as well as for water, oil, air and general usage.



Fabricated of ferrous metals and non-ferrous metals for use with specified fluids, they are available in cleanable and non-cleanable models. The strainers are built with reinforced Monel and stainless steel screens of 60 and 80 mesh, with up to 180 square inches of screen area. Finer meshes are furnished on order. These strainers are available with connection sizes up to 5/8-inch SAE, 3 5/8-inch sweat and 1 1/4-inch FPT with flange.

More information? Circle Item 14 on postcard, page 148.

Gas Burners for Two Functions

Two monoport gas burners featuring low initial cost, compact design, and high efficiency are announced by Barber Gas Burner Co., Cleveland, Ohio. The burners are designed for conversion and original equipment.

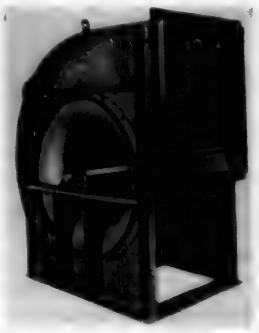
One of the new burners, called the SNG1-A (right), is offered to heating contractors for conversion applications in residences. It is rated on natural or mixed gas from 65,000 to 185,000 Btu per hr input and on LP gas from 75,000 to 105,000 Btu per hr input. It is installed exactly like an oil burner and in most conversions from oil the combustion chamber need not be altered. This burner has no moving parts. It consists of a pressed steel venturi enclosed in a blast tube. Expensive foundry patterns are eliminated. The pilot assembly and all interior parts can be quickly removed for inspection or partial replacement. It is furnished with complete automatic controls and can be adapted to furnaces or boilers with equal efficiency. It is listed by The American Gas Association.

Built along the same design principles as the SNG1-A, the V line of burners (left) is offered to furnace and boiler manufacturers in ranges from 65,000 to 300,000 Btu per hr input on natural and mixed gas, 65,000 to 250,000 on mfg gas, and 65,000 to 150,000 on LP gas. Incorporating most of the features of the conversion model the V burners have been designed for easy access to all parts. The pilot assembly, for example, can be removed by unfastening two screws. The elimination of costly foundry patterns again lowers manufacturing costs and permits variations in tube length. The burner is especially designed for small combustion chambers although the venturi tube is available in lengths up to 20 inches for larger chambers. The V line can be supplied with or without controls. The laboratory facilities of the maker are available to manufacturers interested in adapting the new burner to their specific products.

More information? Circle Item 15 on postcard, page 148.

Improved Class I and II Fans

A line of standard duty fans with an improved power limiting wheel is announced by The New York Blower Co., Chicago, Ill. Available in a wide range of sizes, the fan has a ruggedly built wheel with streamline spun front plate and hub, all welded; a scroll designed for proper pressure conversion within the fan, and a spun inlet cone which directs air to the wheel at the proper flow angle.

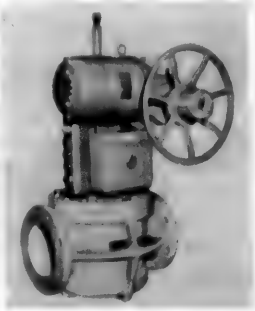


Housings of certain sizes are easily rotatable in the field while those of larger sizes are fixed. Heat fans are available to 600 deg F. Shafting is oversized, thus increasing bearing sizes to lengthen life. Lifting eyes are provided for ease of installation.

More information? Circle Item 16 on postcard, page 148.

Drive For Rotary-Type Valves

A line of electro-automatic and manually operated drives for rotary type valves is placed on the market by Janette Electric Mfg. Co., Morton Grove, Ill. This line, designed for rotary type valves, consists of over thirteen models.



The mounting flanges are separate from the main housing, providing flexibility enough to meet the mounting specifications of the majority of rotary type valve manufacturers. Operating speeds conform to the 15 and 7 1/2 second operation of the rotary valves for which this equipment was developed. Another feature includes the Guardian-cutout which automatically and instantaneously disengages the motor in the event of the valve closing against an obstruction. A particular feature of the electro-automatic valve drive is a new type handwheel and clutch. In event of an operation failure, the valve drive may be manually operated by means of this handwheel and clutch which is standard equipment on each model. This handwheel conforms to the usual requirements and also features such characteristics as: it is stationary during electric operation because it is normally disengaged; it can be operated with one hand; it can be engaged or disengaged at any time without shock to the machine or to the operator; it may be used as an emergency cutout in the event it is desirable to temporarily disrupt an electric operation.

More information? Circle Item 17 on postcard, page 148.

Thermal Humidifier Developed

A thermal humidifier which teams up with the regular heating system to maintain a steady level of humidity has been developed by Flight Mfg. Corp., Camden, N. J.

Called the H. D. 100, this thermal humidifier features an electric heating element which is entirely automatic in its operation. The humidifier diffuses over four gallons of water in 24 hours in the form of vapor emanating at 200 degrees F. The water feed is automatic. All metal parts in contact with water are of corrosion resistant brass and copper, and all fittings are brass. An asbestos gasket is furnished for backing to the face plate. The unit's electric heating element is 600 watts, 115 volts, copper sheathed, and wired to a junction box which is an integral part of the humidifier. A micro switch is also enclosed in the junction box to cut off current to the heating element upon water failure.

The tank, made of 24 gage brass, is six inches wide, five inches high, and eight inches long. The face is ten inches wide and nine inches high, and is made of 22 gage steel with two coats of phosphoric acid base primer and finished in a wide range of colored enamels with Dow Corning silicone resins. Two models are available; the H. D. 100 duct-type model, and a similar model, the H. R. 200, which is used for direct space humidification. Packed, the units weigh approximately five pounds.

More information? Circle Item 18 on postcard, page 148.

Two-Stage Pumps Announced

A series of two-stage pumps for handling clear liquids is announced by Goulds Pumps, Inc., Seneca Falls, N. Y.

These pumps, designated as the Fig. 3305 line, are available in 5 sizes, providing heads up to 1,000 ft, and capacities up to 1,000 gpm. Opposed impellers insure hydraulic balance, and thrust balance is achieved by the use of a unique labyrinth diaphragm. The casing is horizontally split, and the interior can be inspected, and the rotating parts removed and replaced, without disturbing piping connections. Bearing spans have been kept short, resulting in a space saving. Wide interchangeability of parts has been provided, so that spare parts inventories can be kept at a minimum. Only two shaft and rotating parts assemblies are necessary to cover all five pump sizes. Many of the parts of the Fig. 3305 pumps also are interchangeable with the company's Fig. 3405 single-stage pumps which were introduced a year ago.

The direction of rotation of the new pumps can be changed in the field, without any additional parts. This is made possible by a patented locking shaft sleeve which also is used in the Fig. 3405 pump. The pump can be supplied with either conventional stuffing boxes, or with mechanical seals, as desired. Standard features of the Fig. 3305 pump include sealed bearing housings, protecting bearings against moisture and dirt, cowl-type glands suitable for use with quenching liquids, stainless steel impeller keys, Teflon water-seal rings, corrosion resistant gland bolts, renewable stuffing box bushings, and die-formed packing.

More information? Circle Item 19 on postcard, page 148.

Packaged Units Are Air-Cooled

A line of packaged air conditioning units requiring no water is introduced by Carrier Corp., Syracuse, N. Y.

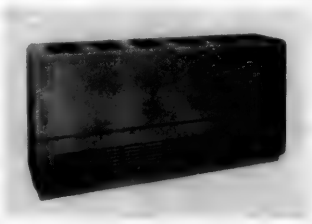
Designed particularly for use in stores, suites of offices and other large spaces where water may be limited or where there may be piping difficulties, the Weathermaker models (shown at right) employing air-cooled refrigeration are manufactured in four sizes from 2 to 7½ hp. Installations requiring greater air-cooled capacity can be easily handled by multiple units. The high-capacity air-cooled models provide cooling, dehumidification, filtering and circulation of air from a single compact cabinet. They may either be installed directly in the space to be conditioned, releasing air draftlessly through directional louvers, or distribute conditioned air by means of ductwork from a concealed location. All essential refrigeration and air conditioning components except the air-cooled condenser are housed in a single cabinet. The air-cooled condenser in its weatherproof casing may be placed at any convenient outside location such as the top of a roof (as shown in photo at left) or setback area, or located inside, in a storage or supply closet, or furred into the wall with ducts to provide a supply of outside air.

In addition to supplying summer cooling, the self-contained unit can be installed with a special coil for conditioned winter heating. Any source of steam or hot water can be used. Ductwork can be led either from the top of the units, or from the side if headroom is limited in some commercial applications. If floor space is at a premium they can be suspended from the ceiling or installed on top of built-in shelving or cabinets. Heart of the system is the direct-drive, hermetically sealed refrigerating compressor. Protecting the refrigerating and conditioning equipment is a rugged cabinet built of cold rolled steel, which is bonderized and coated with a rust-resistant primer and finished with baked enamel. The heavy gage cabinet will withstand heavy usage.

More information? Circle Item 20 on postcard, page 148.

Console Heaters Restyled

A completely new styling and a wide range of colors for the Herman Nelson line of console heaters is announced by American Air Filter Co., Inc., Louisville, Ky. The heaters, which have been designed to meet the demands of architects, have all the engineering advantages of the popular deluxe (cabinet type) heater plus completely new styling elegance.



Advantages of the new heaters include a removable base for wall-hung units; a new key-operated two-speed key switch that is operated through the grille, removing the need for an access door; a one piece front panel for fully recessed wall or ceiling applications; and, easy access to all parts by the removal of only two chrome-plated key-operated screws on the front panel.

Another outstanding feature is the wide choice of colors available. Console heaters are offered with a basic color of grey. Units are also available in seven different colors and in many two-tone designs.

The heaters are outstanding in their variety of uses—floor mounted, wall mounted and semi-recessed, full-recessed, ceiling mounted, ceiling semi-recessed and full-recessed, and wall inverted.

The heaters are applicable to all public, institutional and commercial-type buildings.

Technical details are contained in Bulletin 727.

More information? Circle Item 21 on postcard, page 148.

Control for Weekly Scheduling

A full week's scheduling of automatic on-off control, for year-round use, is possible with the introduction of the 7-Day Dial by Tork Clock Co., Inc., Mt. Vernon, N. Y. This new addition to the company's line of switches for automatic control of electrical devices will permit the programming of operations without the need for manual control to alter schedules as daily needs require.

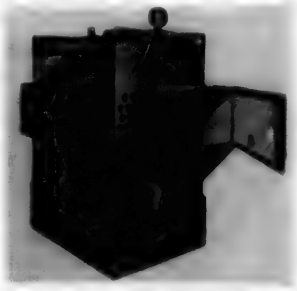
The 7-Day Dial is sectioned and marked for each day of the week, with each of the sections slotted to accept programming tabs. Divided and marked into 2 hour periods, at even hours, there are a total of 84 slots. The Tork switch is installed into the line controlling the electrical device, and unless altered, is always in the off position. Tabs are inserted into the slots for the hours that on operation is required. As the slow-moving dial rotates, the tabs reaching the on contact close the circuit, turning on the lights or heating system being controlled. When the last tab passes the switch, pressure is removed from the contact and the device returns to the normal off position.

The device could be used to program heating, ventilating, or air conditioning of office and factory buildings. For example, heating may be scheduled so that if a building is open weekdays until 10.00 p. m. and Saturday until 4:00 p. m., and closed Sunday, tabs inserted to cover these time periods will permit the instrument to supply heat only during the required periods.

More information? Circle Item 22 on postcard, page 148.

Boiler Has Low Waterline

A firebox construction, low waterline boiler, the LWL Series, is being made by Portmar Boiler Co., Inc., Brooklyn, N. Y. Designed for steam and hot water systems for larger buildings, this boiler is available in 16 sizes, oil or gas fired, for small and large apartment houses, commercial and public buildings, industrial plants and institutions, schools, hospitals, or housing projects.



Capacities range from 3,650 to 42,500 sq ft steam and 5,840 to 68,000 sq ft water. Btu output ranges from 876,000 to 10,200,000 per hour. Built to ASME boiler code standards, the boiler is claimed to have plenty of built-in reserve to meet emergencies, shell is constructed of heavy plate steel, staggered boiler tubes are said to be of heavy steel wall thicknesses and uniform strength, large furnace volume extracts full benefits of fuel through rapid and thorough heat absorption, heavy flange steel plate firebox crownsheet over the hottest boiler temperature permits faster circulation. The fully insulated flue door is multi-purpose, prevents warping and gas leakage, has observation opening for fire inspection, and all tubes are readily accessible for easy, thorough cleaning. The low waterline makes a compact, space-saving boiler which overcomes low head room problems. Working pressure for steam is 15 lb; water is 30 lb. The boiler is also available for 100 lb water working pressure.

More information? Circle Item 23 on postcard, page 148.

Load Transducers

Static or dynamic values of weight, force, compressive stress, or tensile stress are accurately transmitted by the Series 140 load transducers now available in ranges from 500 to 50,000 lb from Daytronic Corp., Dayton, Ohio.

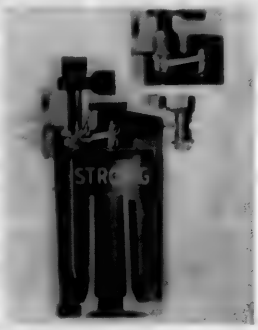
Based on the differential transformer principle for measuring minute displacements of an iron core in an inductive field, the transducers feature 1% linearity, a frequency range from zero to 1000 cps, and exceptional stability of calibration and zero point. Temperature error and hysteresis are negligible. Transmitted values can be measured with an accuracy better than 1% and indicated, recorded, or used for control functions using associated equipment available from the manufacturer.

More information? Circle Item 24 on postcard, page 148.

Steam Trap Line Announced

A line of low, medium and high pressure steam traps is announced by Strong, Carlisle and Hammond Co., Cleveland, Ohio.

The line, known as Hydro-Flex steam traps, is available in semi-steel, cast steel and forged steel construction for use on any and all pressures up to 2500 psi and temperatures to 1100 deg F.



The manufacturer states that a feature of the trap is low maintenance cost. To accomplish this, all of the internal working parts are of heavy stainless steel to withstand the most severe operating conditions. The bucket is of stainless steel, deep drawn with no seams or joints. There are no removable pins. An additional feature of the trap design is the dual fulcrum which powers the valve lever. This includes a primary high leverage fulcrum for cracking the valve from its seat and a secondary low leverage fulcrum to open the valve wide and give maximum unrestricted flow. This discharge arrangement is claimed to make possible high discharge flow rates when required, yet permit efficient handling of very low condensate loads.

More information? Circle Item 25 on postcard, page 148.

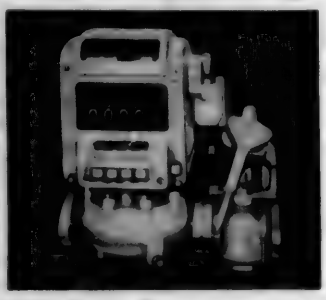
Diaphragm Operated Draft Gage

Diaphragm operated Vertiscale gages, introduced by The Hays Corp., Michigan City, Ind., are claimed by the manufacturer to be a new design in draft gages. The units can also be employed for remote indication of pressure, flow, level, temperature, and O_2 in flue gases. Features of the unit include removable units, one man zero check, and fluorescent lighting.

More information? Circle Item 26 on postcard, page 148.

Meter Has Electrical Switch

An Auto-Switch meter featuring a built-in, explosion-proof electrical switch which is actuated automatically when any desired quantity of liquid has passed through the meter, is being manufactured by Neptune Meter Co., New York, N. Y. The switch can be used to turn pumps on or off, actuate solenoid valves, start agitators, or control other cycling operations by use of suitable relays. The Auto-Switch feature is available either with or without the mechanically coupled Auto-Stop valve, which also is actuated by the tripping mechanism in the register.



In a typical example using the Auto-Switch Register with Auto-Stop valve, the operator turns a knob to clear the register back to zero. He pushes buttons to set the register for the required number of gallons or pounds of liquid ingredient to be delivered to a kettle or mixing tank. He then opens the Auto-Stop valve to start the cycle. This also actuates the switch. The switch may start an agitator motor, open a remote valve, operate a signalling device, or start the pump. When the desired quantity has been delivered, the register trips the Auto-Stop valve and at the same time actuates the electrical switch. Operation of the meter without the coupled Auto-Stop valve is similar, except that the cycle is started by turning a knob at the back of the register. The register is set by pushing buttons. The large numerals on the face of the meter keep pace with the flow, and provide a visual check when the delivery is finished. Flow can be stopped at any time by pressing the emergency stop button. A smaller set of numeral wheels register cumulative totals, useful for inventory and cost accounting.

The electric switch is available on the company's Type S meters in sizes from 1 to 4 inches for rates of flow up to 500 gpm. In combination with the coupled Auto-Stop valve, it is available in sizes from 1 to 3 inches, for rates of flow up to 300 gpm. More than 150 different industrial liquids can be measured accurately with these meters. The switch is a Microswitch, rated at 15 amps, 125, 250 or 460 v, a.c., single pole, single throw, normally open or normally closed.

More information? Circle Item 27 on postcard, page 148.

Ultrasonics Clean, Inspect

The application of ultrasonic vibration to its visible penetrant inspection method with improvement in speed and effectiveness is claimed by The Met-L-Chek Co., Los Angeles, Calif.

The ultrasonic equipment is compact, moderate in price, and simple in operation. It can also be used for general surface cleaning when soil removal is desired for plating, painting and other processing. High speed vibration is claimed to greatly accelerate penetration, water washing to remove excess penetrant dye, and development of flaw indications.

More information? Circle Item 28 on postcard, page 148.

Moisture and Oil Separator

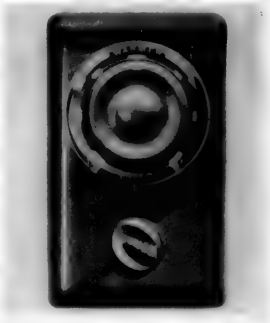
A heavy-duty, high-capacity moisture, dirt and oil separator for compressed air lines and equipment is announced by Beach Precision Parts Co., Boonton, N. J. Called the model No. 125S, the unit provides 125 cfm at 100 lb pressure for ½-inch connections.

Equipped with four Sta-Dri cellular filters, Model 125S is designed to handle 2 million or more cubic feet of compressed air without change of filter elements. The filters are of a special formula and designed for long, constant use without plugging from mushing. The unit is fabricated from 3-inch wrought iron pipe and fittings and is hot dipped galvanized inside and out to resist corrosion.

More information? Circle Item 29 on postcard, page 148.

Thermostat for Electric Heating

The Comfort-Ease, a thermostat designed for electric resistance heating, is introduced by Sunwarm, Inc., Kingsport, Tenn.



Utilizing a hydraulic action element, the thermostat features a cup and diaphragm directly exposed to the air and to the radiant effects of panel heat. Highly sensitive in nature, it maintains a desired balance between air temperature and surface temperature, allowing one to drop as the other increases, thus maintaining uniform comfort rather than a uniform air temperature. The thermostat is not affected by altitude, humidity or other local conditions. The design of the switch, together with the sensitivity of the element, combine to give an operating air temperature differential of not more than ½ deg F. This inherent low differential has the effect of modulating the panel temperature, the average difference between the *off* and *on* cycle being about 5 deg F. Operating with equal effectiveness in either mild or severe weather, the thermostat automatically cycles the heating panel to maintain the desired comfort with maximum economy. The complete unit is regulation size, fitting into the standard wall outlet box, with a modern exterior design blending with any wall and room decor.

More information? Circle Item 30 on postcard, page 148.

Process for Odor Prevention

Development of an efficient, low-cost process for removing industrial odors and fumes and recovering vapors from plant exhausts is announced by Chemurgic Process Corp., New York, N. Y.

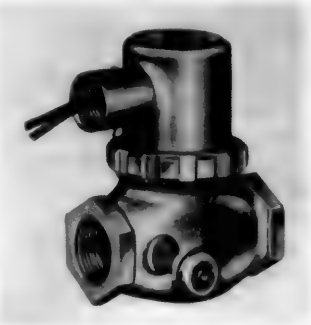
The process, called Siftaire, makes use of the lung-protecting principles of the gas mask. According to the company, it represents a practical industrial application of activated carbon for cleaning hot, wet exhausts and recovering vapors, while permitting regeneration of the carbon. The process is applicable to the following industries in recovery operations or in odor or fume prevention; antibiotics, chemicals, cork, edible oils, fish, fertilizer, insulation, sewage, meat packing, pharmaceuticals, rendering plants, paints and varnish, pulp and paper, plastics, rubber, petroleum, glue, soap and detergents.

In the process, tiny granules of activated carbon are packed between screens in thin panels. The frame of each panel is hollow aluminum or stainless steel tubing. When regeneration is required, which is determined automatically, shutters close, sealing in the carbon. The hollow frame tubing is perforated, and steam at a temperature of 300 degrees is forced through the carbon, driving off the adsorbed gases. If recovery of the vapor is desired, it can be condensed or collected by other means for reuse. If the vapor is to be destroyed, it is piped from the closed-in panel to a furnace where complete combustion converts the odorous substance into odorless and colorless carbon dioxide and water. In many instances steam from the plant's existing equipment can be used for the regeneration process, and the material to be destroyed can be piped to the plant's furnace. A feature of the thin panels is that no extra pressure is needed to force the exhaust through the carbon. A standard mechanical ventilation system is adequate.

More information? Circle Item 31 on postcard, page 148.

Quiet-Operating Solenoid Valve

A solenoid-type gas valve that is claimed to be exceptionally quiet in operation is placed on the market by White-Rodgers Electric Co., St. Louis, Mo. The unit is substantially a conventional solenoid valve, but with the power element resiliently mounted to a Buna N synthetic rubber base enclosed in a sound-deadening chamber, and featuring a soft seat with compression spring closure.



The soft seat is also of synthetic rubber, bonded to an aluminum insert which is screwed into the valve body and may be replaced in the field. A spongy piece of the same material is used in the assembly that attaches the aluminum closing disk to the plunger, thus cushioning the impact of the valve opening and closing. The manufacturer claims that this design eliminates all transmission and radiation of sound to pipe, mounting structure, or outer valve casing, as there is no direct contact between any metal parts that might transmit operating sounds.

The valve operates from a current of 0.4 amp, and is available in ½, ¾, and 1-inch sizes, with capacities of 340, 450, and 775 cfh (0.6 specific gravity gas at 1-inch pressure drop), and a pressure rating of ½ lb per sq in. The valve may be used with all type gases, including L-P and those with high sulphur content. An optional feature is a knob type manual operator, located on the side of the valve, for use in the event of power failure.

The manufacturer states that its small overall dimensions, high capacities, and quiet operation make the valve ideal for controlling the gas flow on all gas-fired applications, particularly wall and floor furnaces, unit heaters, room circulators and conversion burners, where silent operation is highly desirable.

More information? Circle Item 32 on postcard, page 148.

Ultrasensitive Thermo-regulator

A new type mercurial thermo-regulator for precise control of temperature circuits in viscosity baths and similar operations is announced by Precision Thermometer & Instrument Co., Philadelphia, Pa. Called the Magna-Set, this instrument is claimed to have an accuracy and sensitivity hitherto unavailable even in fixed-contact thermostats. Under favorable conditions, constant temperature baths are said to be controlled within ± 0.002 deg C by the device.

More information? Circle Item 33 on postcard, page 148.

Gas-Fired Lowboy Made in 8 Sizes

A new, gas-fired, low-boy style winter air conditioning unit designed for basement installation and available in eight sizes, ranging from 75,000 to 300,000 Btu per hour input, is announced by the Sunbeam Air Conditioner Div., American Radiator & Standard Sanitary Corp., Elyria, Ohio.

This all-steel unit, designated as Model GLA (gas low-boy assembled), is completely assembled and wired at the factory, and installation tested there by actual gas firing and operation of the blower and controls.

Compact design permits shipment of the five smaller sizes, 75,000 through 175,000 Btu input, in a single carton that readily passes through a standard width doorway. The three larger sizes are factory assembled and wired but shipped with the blower section in a separate carton for easier handling at site of installation.

Engineered with jet action heating element and improved ribbon type burners, this model burns all gases, natural, mixed, L.P. or L.P.-air. Blower is cushion mounted for quiet operation. Jacket is heavy-gage steel finished in Forge Red.

More information? Circle Item 34 on postcard, page 148.

Fire-Proof Thermal Insulation

To meet unusually rigid fire regulations, combination asbestos and aluminum insulation blankets are now being manufactured by Infra Insulation, Inc., New York, N. Y., for 16 and 24 inch joist centers. The resistance of asbestos to fire and chemical action is combined with the resistance of multiple accordion aluminum to heat and vapor flow with this latest addition to the company's line of insulations.

The new product, known as Types 6AP and 4AP, is made with inorganic, inert asbestos instead of standard fire, mold and insect-resistant fiber, and is believed to be the first insulation of its kind. Non-metallic partitions play the important role in all multiple accordion aluminum, of creating additional reflective air spaces and so enhancing insulation value. They keep the metals permanently separated, thereby preventing metal from touching metal, which retards heat flow through them by conduction. Without adding excessive weight or bulk, the Type 6AP consists of three tough, commercially pure aluminum sheets, six reflective surfaces, two alternate, asbestos separators and six reflective spaces. Type 4AP is essentially the same, but has two sheets of aluminum separated by one sheet of asbestos with four reflective surfaces and four reflective spaces.

The asbestos itself will withstand temperatures of 800 deg before disintegrating. It is shielded on both sides by aluminum sheets which have a melting point of 1220 deg. This is an aid in reducing the hazards of secondary ignition in other parts of a structure which might otherwise get overheated and burst into flame.

Of prime importance is the insulation's resistance to vapor flow. The aluminum sheets being metal, constitute the best commercial vapor barrier available, being practically impervious to vapor flow. This insulation, too, comes in long, continuous blankets from 125 ft. to 375 ft. long. Infiltration under the flat, stapled flanges is slight.

Like all of the company's multiple accordion line, the new asbestos aluminum insulation is installed in one simple operation. It comes compressed flat for compact shipment. Easily and quickly, it expands on-the-job and staples into place for permanent attachment. It is prefabricated so as to open out automatically into multpile layers of air spaces, aluminum and fiber. Each of the component sheets reaches between the joists and extends down throughout the flanges where they are secured into the joists.

More information? Circle Item 35 on postcard, page 148.

Pop-Off Relief Valve

A Pop-Off relief valve of simple construction is being made by James-Pond-Clark, Pasadena, Calif. It seals tight with no leakage below release pressure and reseats dead tight within 10% of this value. Sealing is provided by a resilient member fitted into the poppet head which seats into a spherical section in the valve body.

When in the closed position, the metal-to-metal seating limits the compressive load on the resilient seal and contains it to withstand the pressure load. The spherical valve seat eliminates the need for close stem alignment and troublesome close sliding fits in the sealing area.

Adjustment is internal, protected and cannot be tampered with. It is recommended for applications where pressures are from 1 to 125 psi and maximum flow and minimum pressure drop are required.

More information? Circle Item 36 on postcard, page 148.

1955 Oil Heater Is Introduced

Electrical safety controls and a streamlined venting stack are features of the 1955 model VO 168,000 Btu per hr heat machine introduced by Fageol Heat Machine Div., R. D. Fageol Co., Kent, Ohio.

The controls are grouped at the front of the machine. They consist of a stack switch, fan limit switch and master switch. The stack switch is a safety device which shuts off the oil burner if oil does not ignite within 90 seconds after it is first sprayed on the burner. The switch must be reset manually before the burner can be restarted. The fan limit switch controls the blower atop the machine and also serves as a safety switch. It automatically holds temperatures between pre-fixed limits and prevents overheating. The master switch cuts off all controls and motors and operates manually.

More information? Circle Item 37 on postcard, page 148.

Plastic Filter Attracts Dust

Woven plastic filters reported by the manufacturer for the life of the equipment are placed on the market by Stoddard Industries, Inc., Chicago, Ill. The woven plastic can be cleaned quickly, average time is claimed to be only 2½ minutes, and put back into service. Ordinary dust and dirt are flushed out with tap water; oil and grease deposits can be removed easily by scrubbing with a sponge or brush, and a detergent.

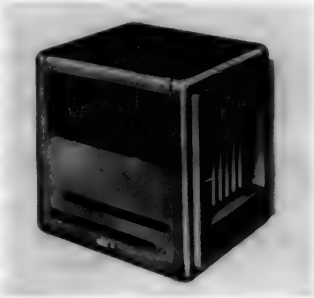
Manufacturers of air conditioners that include the Dust-magnet filter furnish pocket-size swatches of the plastic filter material. Salesmen use them to show how they pick up dust like a magnet picks up metal. The 1955 line includes five models with dust pick-up capacities ranging from the equivalent of a half-inch conventional filter to better than one inch. The woven plastic is mounted in an economical, half-inch frame of rustproofed steel. The Dust-magnet will be a component in several types of refrigeration equipment, it is reported, in addition to widespread use in the air conditioning field in 1955.

More information? Circle Item 38 on postcard, page 148.

Sectional Assembly of Duct Heaters

Sectional assembly to simplify installation, a new concept in duct heating equipment, is the feature of a new series of large capacity duct furnaces developed by Reznor Mfg. Co., Mercer Pa. With these new units it is possible to install custom engineered heating systems with total capacities of 2,000,000 Btu per hour and above from sections weighing no more than 315 pounds.

The series contains an almost unlimited number of sizes ranging upward in steps of 50,000 Btu input from 150,000 to several million Btu. A second completely new duct furnace series includes four small capacity units ranging from 50,000 to 125,000 Btu. Both new designs offer complete flexibility for use in custom engineered heating systems.



The new units are compact, highly effiicient heat exchangers, each with a full complement of combustion controls. All other components, for air moving, cooling, cleaning, and humidification and for temperature control, are selected by the heating engineer to meet the exact requirements of each installation, thus providing a system of maximum efficiency at the lowest possible cost. The duct furnaces can also be installed as booster units in long duct runs to supplement other warm air heating equipment.

Designed for installation as an integral part of the duct system itself, all units are equipped for either suspended or base mounting. Because air flow through the heater may be in either direction, the units can always be mounted in the duct so as to provide easy access to controls and burners. All have built-in draft diverters. Corrosion-resistant aluminized steel heat exchangers and cast iron universal-type burners are standard on all models. Mounting of the burners so that combustion occurs directly into the heat exchanger tubes means maximum efficiency and minimum over-all size.

Heater capacities in the large (DS) series are arrived at by combinations of the four basic sections which are 150, 200, 250 and 300 thousand Btu per hour. To simplify installation and provide for optional seasonal use of part of the installed capacity, all DS models larger than 300,000 Btu are shipped in sections. Because sections may be installed side-by-side in a single bank or back-to-back in a double bank, over-all dimensions depend on the manner of installation. All sections are 37 inches high by 24 inches deep. Width varies according to capacity.

The D series duct furnaces (illustrated) are in four sizes, 50, 75, 100 and 125,000 Btu per hour, and are assembled with the burner access and controls completely enclosed on one side. All models are 22 inches wide by 23 inches high with a 20 inch square duct flange at each end.

More information? Circle Item 39 on postcard, page 148.

Cold Drawn Wrought Iron Tube

Corrosion-resistant cold drawn wrought iron tubing, manufactured to precise tolerances for installation in heat transfer apparatus and air conditioning systems, is being marketed by A. M. Byers Co., Pittsburgh, Pa.

First installations of cold drawn wrought iron tubing began in 1946. An analysis of results to date has proved the product's merit under actual operating conditions in a broad field of applications.

Specific services in which the tubing's resistance to corrosion and fatigue failure help reduce the frequency of repair or replacement include: Ammonia condensers, heat exchangers, pre-heaters, gas cooling apparatus, gasoline condensers, evaporators, vaporizers producing butane and propane gas, cooling pipe and steam condensers.

According to records maintained by the makers' engineering service department, the cold drawn tubing is especially suitable for handling salt and brine solutions in air conditioning systems.

Wrought iron tubing is manufactured to closer dimensional tolerances than wrought iron pipe. In actual physical characteristics, however, wrought iron tubing and pipe are similar, each providing identical protection against corrosion and fatigue failure.

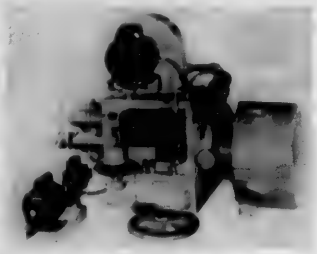
Like wrought iron pipe, the cold drawn tubing is comprised of high purity iron and iron silicate in physical rather than chemical association. The iron silicate occurs in thread-like form throughout the high purity iron. This combination gives the metal a strong, hickory-like structure and the slag fibers, numbering some 250,000 per square cross-section inch, disperse the attack of corrosive forces and prolong the life of the tubing.

The tubing is currently available in ⅜ to 3½ inch outside diameters and 14 to 8 gage thicknesses.

More information? Circle Item 40 on postcard, page 148.

Packaged Gas-Oil Burner

A self-contained, fan-type combination gas-oil burner for firing rates up to 3,000,000 Btu per hr is being produced by Eclipse Fuel Engineering Co., Rockford, Ill. Completely packaged, the unit includes blower, burner, oil pump with motor, built-in tuyere, air/gas mixer, safety equipment, transformers, valves, regulators, filter, piping, and wiring.



The rotary flame SP-890 can be used with gas and light oil, oil or gas for automatic off-on firing of steam boilers, water heaters, air heaters, heating plants, industrial ovens, bake ovens, and similar applications. A snap-switch control located on side panel of the burner changes fuel automatically. The switch sets all necessary controls in operation for particular fuel desired. No mechanical or electrical changes are necessary. Unusually clean firing is claimed by the manufacturer to result from operation of an outside-mounted air switch, which is interconnected with fuel controls. This switch delays opening of the main fuel valve until air pressure is at full on to deliver the correct amount of air for complete combustion. The switch also provides a safety feature in that if the air supply fails, all fuel to the burner is instantly cut off.

More information? Circle Item 41 on postcard, page 148.

Mobile Vacuum Pump for Industry

A movable vacuum pump unit for industrial applications has been developed by Vacuum Forming Corp., Port Washington, N. Y.

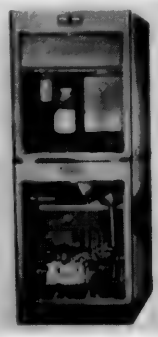
Called the VacForm Mobile Pump Wagon, the unit is housed in a protective metal cabinet with removable panels, mounted on a heavy steel frame with a swing-back top-door opening for convenience. It has rubber-tired, ball-bearing wheels on swivel casters, to permit trundling from place to place by one man without strain. Using gentle pressure on a grip handle at the end of a rod, the operator pushes it to the point of installation. Wheel locks are then applied to keep the unit in place without sliding or slipping. When the pump wagon is pushed into place, it is connected by a heavy-duty hose to whatever equipment is to be used in the vacuum application, such as presses, sealers, concentrators, driers, or molding units. Adaptable to varying electrical requirements, the pump wagon is then plugged into an ordinary electrical connection and is ready for action. An added feature is a system of start-and-stop push-button controls.

The mobile pump wagon weighs 900 pounds, is 3½ feet high, and requires only 4 feet by 2½ feet of floor space. It has a dual-V belt drive and a three-horsepower motor with a service guarantee. The motor is equipped with ball bearings. The unit includes an air-cooled rotary pump with automatic lubrication, a vacuum gage, and an adjustable vacuum shut-off switch. The amount of vacuum to be created can be easily controlled, with a potential up to 29½ inches at sea-level pressure. The pump's 50-gallon welded surge tank has a bottom drain. Other features for convenience and safety include thermal overload protection for the motor and an exhaust filter that eliminates the necessity for either an indoor or outdoor vent.

More information? Circle Item 42 on postcard, page 148.

Residential Heating-Cooling Unit

Production of a packaged controlled water circulation unit to provide winter heating and summer cooling is announced by Combustion Engineering, Inc., Chattanooga, Tenn. The unit is designed to satisfy present and future requirements for heating and cooling in residential and small commercial structures with low installation costs and with economical and outstanding operating characteristics.



Water is used as the controlling medium for heating or cooling filtered air at the desired location by the use of new type room convectors.

The source of and removal of heat to the water is accomplished through gas-fired boiler and a water chiller unit.

The over-all dimensions of the complete packaged unit is 24 inches wide, 25 inches deep and 67 inches high, which permits installation in a small area. The heating unit is furnished completely assembled with burners, circulating pump, controls, relays and all operating parts in place. The first units will have a gas input rating of 110,000 Btu per hour, in most instances suitable for the average seven room house. Boiler heating surfaces are of steel construction. A feature of the heating unit is an aluminized steel burner, designed for use of all type gases.

More information? Circle Item 43 on postcard, page 148.

New Silver Brazing Alloy

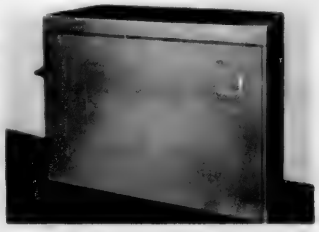
A silver brazing alloy developed to overcome crevice corrosion problems in brazing the 400 series straight chromium stainless steels is introduced by Handy & Harman, New York, N. Y. This type of corrosion problem occurs most frequently where the brazed assembly is subjected to water, steam, or humid atmospheres.

Known as RSNI, the new alloy contains 63.0% silver, 28.5% copper, 6.0% tin, and 2.5% nickel. It melts at 1325 F and flows at 1475 F. This alloy does not flatten out at brazing temperature to form thin fillet edges as do most silver brazing alloys. It is this characteristic which aids in preventing crevice corrosion. However, because of this sluggishness, particular care is required to flow RSNI into the joint. It is available in wire of any standard gage.

More information? Circle Item 44 on postcard, page 148.

Chiller Is Air Cooled

An air-cooled chiller for use in conjunction with its remote air conditioner is announced by Brown Products Co., Forest Hills, N. Y. The manufacturer claims that the chiller, being air-cooled, saves much money since it does away with the need for water cooling towers and accessories, and is particularly useful in areas of limited water supply inasmuch as it does not require water to cool the condensers.



The chiller is supplied completely factory assembled and charged with refrigerant. The company states that the unit is as easy to install as an average package boiler. Features of the unit include automatic step operation which provides, for example, in a 3 hp unit, not just one 3 hp compressor, but instead three 1 hp compressors. In this way, where maximum cooling is not needed, only one or two compressors operate. The manufacturer claims that this feature is a real money saver as well as protection against the chiller ever going completely out of order.

More information? Circle Item 45 on postcard, page 148.

Hydraulic Hose and Couplings

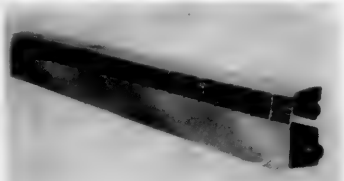
The introduction of a line of hydraulic hose and couplings is announced by Joy Mfg. Co., Pittsburgh, Pa. Tradenamed Surgepruf, the equipment is for medium-high and high pressure service.

The couplings, manufactured to J.I.C. standards, feature a double-wedge grip which the manufacturer claims makes possible assembly on rubber covered hose without skiving. Through use of a slotted bushing, it is possible to retighten the coupling on the hose without disassembly when and if it comes loose through vibration or flexing. No special tools or mandrels are required for assembling these couplings on the hose.

More information? Circle Item 46 on postcard, page 148.

New Baseboard Radiation Line

A line of baseboard radiation, called BE-12, is placed on the market by C. A. Dunham Co., Chicago, Ill. This baseboard, claims the manufacturer, with its increased capacity, is applicable to new or remodeled industrial or institutional buildings such as schools, hospitals, and factories. The company states that its capacity is approximately 40% greater than any previous residential type baseboard of its manufacture.



The baseboard, which can be painted to match any decor, can be installed partially recessed or flush with the wall. An angular louver grille punched in the front of the enclosure, directs warm air out into the room to minimize wall smudging. The heating element has self-spacing fins which may be 3¼ x 3¼ inches or 4¼ x 4¼ inches steel on 1¼-inch steel tube, or 3¼ x 3¼ inches or 4¼ x 4¼ inches aluminum on 1¼-inch copper tube. The company states that a new type element hanger bracket was developed for this line of radiation. The units are available in a full range of sizes with a complete line of accessories, which include a lever type damper. The lever-operated damper is new to this company's line of baseboard and is used to control heat output where regulation is desired. Other accessories are used to complete the installation and help conceal all piping and connections.

More information? Circle Item 47 on postcard, page 148.

Announces Electric Boiler

Manufacture of an electrically-fired automatic boiler, the Autolec, developed in England to supply hot water or steam for many uses, will be started soon by Orr & Sembower, Inc., Reading, Pa.

The boiler will be manufactured using American produced materials by Orr & Sembower in the firm's Morgantown Road plant. The Autolec trade name will be retained for marketing purposes.

While noting that the demand for electric boilers has been small in this country because of the relatively low costs of gas and oil, the company points out that an electric boiler has several specialized applications and advantages. Electric boilers would be completely clean and noiseless, would require no exhaust vents, and would permit installation at almost any location in a building.

More information? Circle Item 48 on postcard, page 148.

Cooling Tower Line for 1955

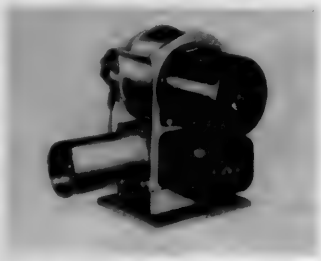
Two 10 and 15-ton models are featured by Acme Industries, Inc., Jackson, Mich., in its Flow-Cold line of all-metal cooling towers for 1955. The units can be installed indoors or outdoors. The manufacturer states that their heavy galvanized finish makes them rust-proof and corrosion resistant and eliminate the need for painting or other surface maintenance. Blower and pump motors are weather protected.

All three models are compact. The 15-ton model (illustrated) measures slightly less than 6 ft high and 5 ft long by 31 inches wide, exclusive of the optional pump. The 2-ton model, designed specifically for the residential market, is 52 x 19½ x 17½ inches for the corresponding dimensions. In areas with relatively low humidity (75 deg wet bulb or below) this tower will handle a 3-ton cooling load. Throughout the line are featured the company's wetted metal-deck principle of heat transfer and space-saving, all-metal construction. The Z-shaped baffles of the company's Acme Pak provide maximum diffusion of water droplets and the greatest amount of wetted metal surface in the smallest cubic space. Fast heat dissipation through evaporation and heat transfer to the air stream result.

More information? Circle Item 49 on postcard, page 148.

Redesigned Conversion Burner

A redesigned conversion burner for oil-fired installations is placed on the market by American Radiator & Standard Sanitary Corp., Pittsburgh, Pa. Called the Arcoflame burner, the unit is adatpable to a number of heating jobs.

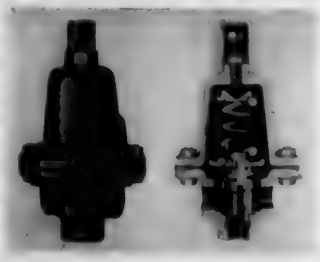


The entire casting is made of steel, and has a Forge Red jacket with black trim to harmonize with any oil-fired boiler or furnace. This conversion burner includes NEMA motor, Sundstrand fuel unit, Jefferson transformer, and Torrington blower wheel, and the 14-gage steel housing is claimed to surpass U.L. requirements. The unit is available with pedestal, hanger, or flange mounting, and with varying gun lengths so that it fits a wider variety of heating units. The oil flow is regulated to eliminate feed-back hum and provide quiet operation. The burner is adaptable to two of the company's oil boilers, the Arcoliner, and the Oakmont. It can also be used with older hot water or steam boilers or warm air furnaces to provide automatic heating.

More information? Circle Item 50 on postcard, page 148.

Back Pressure Relief Valves

A series of Type FR back pressure relief valves in sizes from ½ to 2 inches in iron, bronze, stainless steel and monel is announced by A. W. Cash Valve Mfg. Corp., Decatur, Ill.



The floating ring principle is the heart of these valves which are suitable for pressures up to 400 psi. The manufacturer claims that by removing all of the friction caused by drag of a piston and cylinder, they have gained high sensitivity and capacity, good closure, and better valve performance. Valves are of the globe type, with side inlet and bottom outlet. They may be installed as angle valves, with one inlet plugged, or in straight-through fashion. Features of the valves include direct operated, packless construction, large capacity, self-aligning seats and renewable parts. The valves are fully adjustable, by means of an adjusting screw under the closing cap.

More information? Circle Item 51 on postcard, page 148.

Add Baseboard Convector to Line

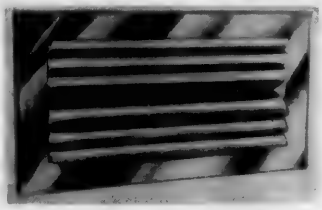
To round out its line of convector-radiators, Young Radiator Co., Racine, Wis., is introducing a baseboard convector called Perimaheat. It is designed for use with hot water heating systems in industrial buildings, institutions, schools, hotels, motels, apartments, public buildings, and residences.

Suitable for fully-exposed or semi-recessed installation, the units are finished in neutral gray and can be painted to match any decorative theme. The baseboard heating element is composed of copper tube and aluminum fins bonded mechanically, providing a continuous heat transfer surface. The units have a heavy gage, one-piece steel back and top, eliminating air leakage and wall streaking. By piercing the back, cabinet can be secured with screws to wall studs. Core hangers are suspended from support brackets in a manner which allows element to expand or contract noiselessly. Front cover snaps tightly into position. Manually-operated dampers adjust to any position from fully open to fully closed for individual room temperature control. Support bracket for front cover and element hanger is designed to facilitate installation of bypass or return tube entirely within the cabinet. The units are packaged in six and eight foot sections.

More information? Circle Item 52 on postcard, page 148.

High Sidewall and Ceiling Grille

The Series 200 grille, especially designed to handle the complex demands of distributing both cool and warm air from ceilings and high sidewalls, is introduced by Titus, Inc., Waterloo, Iowa. The unusual feature of this grille is its adjustability. All of the louvers can be moved to give one, two or four-way diffusion.



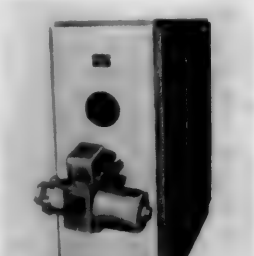
Louvers are made of solid section extruded aluminum, are wide and are curved to handle the air with great efficiency. These grilles have five important applications, for overhead forced air systems, for high sidewall installations, for replacement of old warm air registers when cooling or air conditioning is added, for replacement of old style outlets in problem areas to correct chilling or uncomfortable drafts, and for bringing in overhead air conditioning where steam or hot water are presently being used.

The grille is said to be especially important in the South where many overhead heating and cooling units are now being installed.

More information? Circle Item 53 on postcard, page 148.

Forced Air Furnace

A Lo-Boy forced air winter conditioning furnace is introduced by Quiet Automatic Burner Corp., Newark, N. J. This oil fired furnace is factory assembled with either flush jacket or extended jacket.



Called the Jersey 85 model, the unit has an output of 85,000 Btu per hr. Two other models are available with outputs of 112,000 and 134,000 Btu per hr. Standard equipment on the units include cast iron oil burners, Honeywell controls and precast combustion chambers.

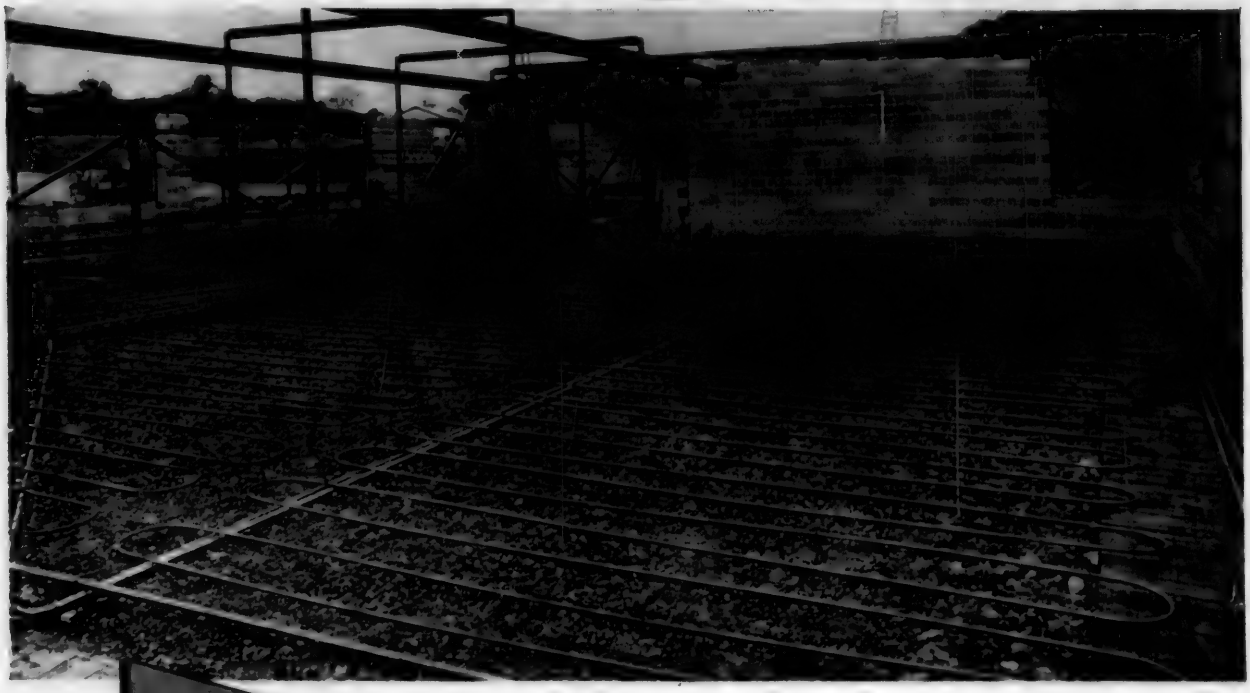
More information? Circle Item 54 on postcard, page 148.

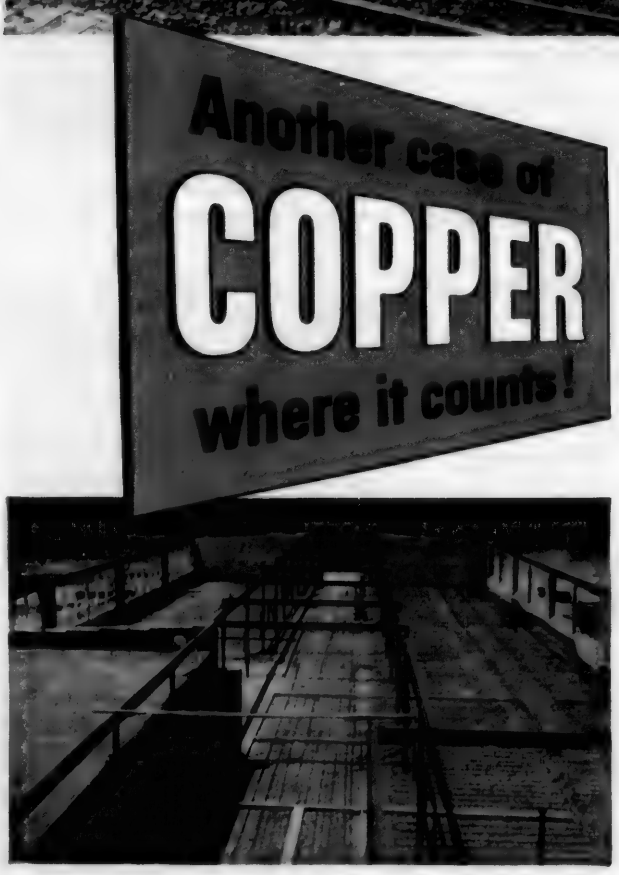
(*Concluded on page* 144)

MANCHESTER ELEMENTARY SCHOOL

Manchester, Missouri

Architect: CHARLES W. LORENZ, Kirkwood, Mo.
Contractor: JUENGEL CONST. CO., St. Louis, Mo.
Radiant Heating: BAGLEY & COMPANY, Inc., Robertson, Mo.
Revere Distributor: GRINNELL COMPANY, Inc., St. Louis, Mo.





TWO VIEWS of the radiant Panel heating layout before concrete slab was poured. Floor area over 17,000 sq. ft. System was imbedded in slab 4". Gravel fill is 6" deep. Coils are 12" OC. System is divided into 4 zones, with all supply and return lines also of copper. Note edge insulation at right in large photo.

Radiant Panel Heating fits perfectly into the growing trend to 1-story school construction. It means warm floors, no drafts, and a healthier atmosphere for scholars. To the architect radiant panel heating means greater latitude in design, more usable space for the money. And for the user it means greater heating efficiency, lower redecorating costs and less cleaning and maintenance than when old-fashioned heating methods are used. The ideal material for panel heating is copper. For no other metal or alloy has all the desirable construction characteristics of this "ageless" metal.

To the contractor, the use of Revere Copper Water Tube means easy bending and handling . . . its long 60′ lengths require fewer fittings, the solder fittings used eliminate the need for welding, wrench work and thread cutting, while its lasting, non-rusting qualities have been proven through the centuries. Even being buried in a concrete slab doesn't bother enduring copper. Copper is the metal you can trust.

Keep out of trouble, protect your reputation for quality work . . . use Revere Copper Water Tube for air conditioning lines, radiant panel heating, hot and cold water lines, underground service lines, waste stack and vent lines, processing lines. See the Revere Distributor nearest you today. And, if you have a technical problem, he will put you in touch with Revere's Technical Advisory Service.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

(*Concluded from page* 142)

Dolly Moves Heavy Equipment

A device known as the Multiton roller skid for moving heavy equipment and machinery is placed on the market by Stokvis-Edera & Co., Inc., Port Washington, N. Y.

The roller skids are designed specifically for inordinate weights. The principle of the device is an endless chain composed of heavy steel rollers joined by link courses around the center piece of the frame. The turntable is furnished with gripping teeth that imbed themselves into the wooden frame underneath the load, as the load is placed onto two or more of the units. When power is applied to the load, the roller skid units move forward, laying the rollers ahead of them, as on a tractor or military tank. Any combination of turns can be easily made. It is also possible to turn a machine completely around on its own length. The manufacturer states that because of their inherent design, the capacity of these roller skids is very large. The load resting on the turntable is transmitted down the side members of the frame, onto the cross member spanning the two side members. This cross member is in direct contact with the rollers, which are in contact with the floor so that actual compression of the rollers is accomplished.

A feature of the units is their self-laying track principle where the actual floor is the centerpiece of the frame. Imperfections, such as cracks and gaps in the floor, do not impede the movement of the dolly. There are always sufficient rollers in contact with the smooth part of the floor that cracks or gaps are simply bridged.

More information? Circle Item 55 on postcard, page 148.

Instrument for Smoke Control

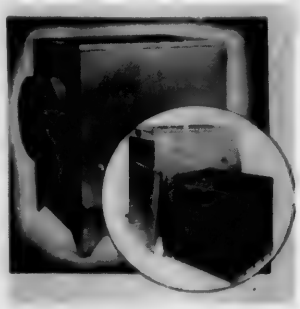
An instrument to aid in compliance with smoke control laws is made available by Mine Safety Appliances Co., Pittsburgh, Pa. Called the MSA Smokescope, the instrument can be used to determine whether or not fuel is being properly burned to gain full Btu per hr advantage, since excessive smoke indicates it is not.

With the device, observers are able to view a standard reference disk, shaded to correspond with degrees of smoke density, against the background of a smoke plume. Light from the area adjacent to the stack is transmitted through one tube of the instrument and through the reference film disk inside the tube to a front surface mirror. Reflected by the mirror, it passes through a lens to an image mirror where it may be directly compared with the smoke as seen through the other tube of the instrument. The reference film disk is placed at the focal point of the lens, and thus has the effect of placing the light rays reaching the eye in a parallel position. Film area is small and acts as a point source. The lens used to project a virtual image of the reference film disk also serves to intensify the light in the reference standard optical path, compensating for the light loss at the reflecting surfaces. The manufacturer states that the design of the instrument eliminates possible interference of ambient light because the viewer user views the smoke through apertures which limit the field of vision to the subject. And there is no necessity to shift the eye from smoke to chart as in conventional chart measurement, since the chart, in the form of the reference film disk, appears against the smoke being viewed.

More information? Circle Item 56 on postcard, page 148.

Newly Designed Cooling Tower

A newly designed cooling tower being marketed by Silvercraft, Inc., Louisville, Ky., under the name of Silvercraft Summer Shower, is claimed by the manufacturer to be a new design in forced draft water cooling.



Of all-aluminum and stainless steel construction, the units provide 2, 3, or 4 ton capacities by interchange of fan blades only. This same feature applies to a larger unit providing 5 or 7½ ton capacities. The all-aluminum wet-deck cartridge slides out smoothly on stainless steel rails for cleaning or replacement. All surfaces exposed to recirculated water are protected by a baked-on No. 406 plastic coating. The aluminum body is finished in bright stucco and baked-on enamel, and stainless steel fittings are used.

More information? Circle Item 57 on postcard, page 148.

Molded PVC Valves and Fittings

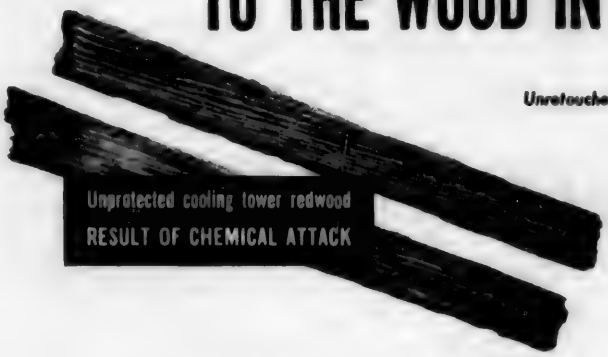
A line of all molded PVC valves and fittings, is announced by The Lunkenheimer Co., Cincinnati, Ohio. This line has been patented and registered under the name Luncor, which refers to its resistance to corrosive chemical action. The valve resists most chemicals used in industry.

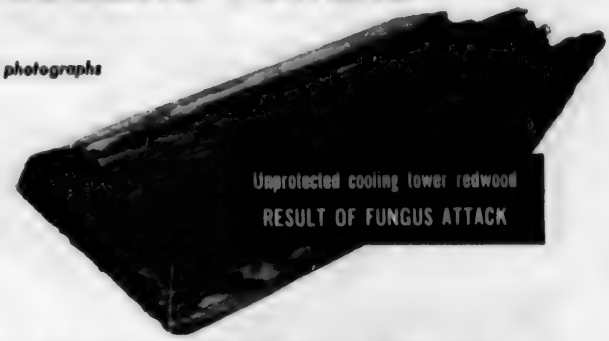
The manufacturer claims that the molding process used, gives the PVC material exceptional strength, protects its natural corrosion-resistance, and substantially reduces manufacturing costs. Base material used for the valve is polyvinyl chloride (PVC), which is now available in the form of corrosion-resistant piping. It is molded in rigid form, suitable for pressures up to 125 pounds and 150 degrees temperature. The valve is presently available in a Y-type globe design. A complete line of plastic fittings made of the same material includes caps, couplings, plugs, unions, reducing bushings, flanges, 45-degree and 90-degree elbows, and tees.

More information? Circle Item 58 on postcard, page 148.

LOOK WHAT CAN HAPPEN TO THE WOOD IN COOLING TOWERS

Unretouched photographs





PRESSURE CREOSOTING ADDS YEARS OF LIFE TO HALSTEAD & MITCHELL COOLING TOWERS

FUNGUS ROTTED UNPROTECTED DECKING

Unretouched photographs

CLEAN PRESSURE-CREOSOTED DECKING

Examine these unretouched photographs carefully. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungus and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in Halstead & Mitchell Cooling Towers is protected against these twin enemies.

WHY PRESSURE CREOSOTING?

Creosote . . . *with 162 elements toxic to fungus growth and parasites* . . . also makes wood more resistant to chemical attack. Deep penetration of the wood by Koppers Pressure-Creosoting gives the longest possible wetted decking life. Therefore, all Halstead & Mitchell Cooling Tower decks are Pressure-Creosoted, and are guaranteed against rotting due to fungus growth . . . for 20 years!

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE against rotting by fungus attack

2 thru 100 Tons

Sheet-Steel Cabinets, 5-times protected
Stainless Steel Fans and Shafts
Weather Shielding
Everdur Bolts for ease of disassembly at any time.

HM Halstead & Mitchell

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EFFICIENT *Extended-Surface* HEAT EXCHANGERS

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Heating
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Air Conditioning

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Your Aerofin man's recommendation means high efficiency, long service life, low maintenance costs.

Aerofin's unequalled laboratory and manufacturing facilities — unequalled knowledge of heat-exchange practice — are devoted exclusively to the design and manufacture of highest quality extended heat surface.

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PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**

or a copy of the following

- **New Catalogs**

Circle the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

ACTIVATED CARBON USES DISCUSSED—Properties and uses of activated carbon in purification, air recovery, solvent recovery, chemical catalysis, and separation processes is discussed in non-technical language in a bulletin, Form 27, available from Adsorbite Div. Barnebey-Cheney Co., Columbus, Ohio. Included are simplified schematic drawings of different types of systems using activated carbon. The bulletin also touches briefly on activated carbon systems engineering services available from the company. .....Item 166

FOLDER DESCRIBES BELLOWS-SEAL VALVES—A 4-page folder describing its bellows seal needle and globe valves is available from Associated Valve & Engineering Co., Chicago, Ill. The folder gives complete information as to service, service range, sizes available, connections, materials, and special features of the valves. Sectional views and tables of dimensions are included. .....Item 168

FIVE LINES OF SYSTEM-ENGINEERED COMPONENTS—Small tonnage condensers, both shell and tube and shell and coil types, 2 to 150-ton heat exchangers and liquid receivers, and a range of Hi-Peak Water Coolers, are the subject of a 4-page catalog No. 200 now available from Acme Industries, Jackson, Mich. Ample data for selecting the proper units are given along with brief descriptions of all major construction features. Selection of Hi-Peak remote storage-type water coolers is simplified by a water range curve combined with performance curves for both intermittent and continuous operation of the seven models. .....Item 169

THERMOSTATS DESCRIBED IN BULLETIN—A bulletin LL-303, describing Stemco Type B bimetal thermostats and Tip-Off Switch is announced by Stevens Mfg. Co., Inc., Mansfield, Ohio. Included in the bulletin are photographs and line drawings of the devices with dimensions and specifications. .....Item 164

BROCHURE ON MULTI - PURPOSE FASTENER—A multi-purpose fastener with a one-piece metal head and pre-assembled neoprene washer is featured in a brochure available from Townsend Co., New Brighton, Pa. Amply illustrated, the brochure (TL 97) shows cross-section of the fastener accompanied by text outlining construction and operational characteristics, and applications of the product. .....Item 165

CATALOG — SAMPLES OF PLASTIC CLOSURES—To informatively present its expanded line of CaPlugs (Polyethylene closures), Protective Closures Co., Inc., Buffalo, N. Y., has made available an illustrated file folder and a representative assortment of samples to those inquiring. Describing fully and concisely the complete line of threaded and non-threaded caps and plugs for safeguarding products in process, storage and transit, the folder is tabbed and punched for easy filing and finding in either binder or cabinet. Enclosed in the folder are complete price lists for over 100 stocked sizes of the five standardized designs used to protect tubing, fittings, valves, hydraulic components and machined parts. .....Item 166

GLASS BLOCKS FOR TOPLIGHTING—An 8-page catalog, Skytrol Glass Blocks for Toplighting your Buildings, is announced by Pittsburgh Corning Corp., Pittsburgh, Pa. The catalog is prepared as a reference manual for architects, engineers and construction people. Information on physical performance, technical data on light transmission, insulating values, installation detail drawings, and complete specifications are fully covered in the booklet. .....Item 167

BOOKLET DESCRIBES HEAT CONTROL SYSTEMS—Bedroom heating and air conditioning problems in hospitals are graphically portrayed in a booklet prepared by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. For hospitals where uncontrolled room temperatures make patients too hot or cold; doctors annoyed; nurses overworked and the housekeeper frustrated, the booklet suggests consideration of the company's individual room thermostatic control system. The system is described and illustrated, listing ways in which the manufacturer claims it can benefit a hospital. .....Item 168

HYDRAULIC SEALING PROBLEMS DISCUSSED—A pictorial brochure, No. 1060, entitled Customized Rubber Engineering is announced by Plastic and Rubber Products Co., Los Angeles, Calif. The brochure describes the types of materials, methods, measurements, and specifications used in plastic and rubber products, its new plant in Houston, and hydraulic sealing problems. .....Item 169

INDUSTRIAL AXIAL FLOW FANS—Bulletin 103-A, 20 pages, has been issued by International Engineering, Inc., Dayton, Ohio, and covering its line of industrial axial flow fans. Each type of fan is comprehensively described; these include extended shaft models, duct fans, spray booth fans, man-cooling fans, blast coolers, and roof ventilators. Ratings, specifications, capacities and construction are thoroughly covered. .....Item 170

PROTECTION AND CONTROL SPECIALTIES—Catalog DE-55 is a 16-page catalog issued by Watts Regulator Co., Lawrence, Mass., covering its protection and control specialties for plumbing and heating systems, including residential, commercial, institutional and industrial. Brief descriptions, illustrations, and tabular data complete the bulletin. .....Item 171

DUST CONTROL IN PHARMACEUTICAL MANUFACTURE—How to control dust in the manufacture of pharmaceutical products is the subject of a bulletin, 150-D, published by American Wheelabrator & Equipment Corp., Mishawaka, Ind. Three illustrated case histories are cited, covering dust control at tablet presses, packagers, mixers, dryers, and materials conveying equipment. All of the case histories are illustrated. .....Item 172

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No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 36, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING
149 LAFAYETTE STREET
NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

DAMPER AND TURNING VANE SPECIALTIES—An 16-page catalog has been issued by the Duro-Dyne Corporation, New Hyde Park, N. Y., describing its line of specialties, including damper regulators, heavy duty quadrants, medium size quadrants, a rail for making turning vanes for square elbows, pre-assembled duct connectors, and kits for damper hardware. Also included in the company's portable spot welder and its line of metal punches. .....Item 133

[illegible] CAPACITY FANS—General purpose fans for ventilating and industrial applications are the subject of Bulletin [illegible] issued by The New York Blower Co., Chicago, Ill., and including its line of fans with forward curved wheels and general purpose power limiting fans. Capacities, tables, descriptive matter and illustrations are included. .....Item 134

CATALOGS AND PRICE SHEET ISSUED—Catalogs describing its hot water circulator and its control valves, as well as a price sheet of its heating specialties, are available from Triplex Heating Specialty Co., Peru, Ind. Form [illegible] describes and illustrates the hot water circulator with cost, photographs and line drawings of the unit. A table of specifications and dimensions for the different sizes is included. The flow control valves are described in Form 854A-1256, including photographs, line drawings, and tables of dimensions and weights and tables of sizes and capacities. A price sheet covering hot water heating specialties for use with its previously issued bulletin 848 is also available. .....Item 135

BLOWER WHEELS—A four-page folder on its new blower wheel designed especially for the air conditioning and heating industry is available from the Marvel Products Co., Dayton, Ohio. Only eight parts are needed to construct the wheel—two blade louvers, two center discs, two hubs and two set screws. This construction is said to mean a longer and trouble-free life. The wheel consists of one rigid unit and due to the design is said to give increased size of inlet, greater blade exposure, and ring construction of airfoil design, and results in quieter operation with higher pressure and with internal turbulance reduced .....Item 136

AIR CONDITIONERS DESCRIBED IN BULLETIN—A four-page bulletin, published by Medina Mfg. Co., Racine, Wis., covers extensively the application and performance characteristics of the company's four types of air conditioners. The bulletin illustrates and describes console, recessed, overhead and deluxe ceiling types. Illustrated portions of the bulletin show uses of the units in office buildings, hotels and motels, hospitals and homes and apartment buildings, and accompanying copy outlines various construction features. A chart covers performances, capacities and sizes of fractional horsepower motors used in each of the four types. Item 137

ACCESSORIES AND INSTALLATION OF HOSE AND DUCT—Accessories for installation of its Flexaust hose and Portavent duct for industrial applications are described in Illustrated bulletin No. 41, Accessories and Installations, published by The Flexaust Co., New York, N. Y. The bulletin shows the use of screw couplings, soft-end cuffs, and flanges for assembling Flexaust hose in long lengths, attaching it to pipe of varying sizes, connecting to outlets of different shapes, and applying to equipment. .....Item 138

[illegible] CATALOG ON GATE VALVES—The availability of a catalog 55G, showing the major stainless steel gate valves in its line, is announced by The Cooper Alloy Foundry Co., Hillside, N. J. In addition to schematic drawings of the various valves the booklet includes a section on design factors, a discussion of construction materials, standards, and quality control measures. It also contains a table of major stainless alloys, giving their designations and applications. .....Item 139

ROOF DRAIN GUIDE—A reference booklet prepared to aid in the specification and installation of roof drains is issued by J. A. Zurn Mfg. Co., Erie, Pa. Titled Zurn Roof Drain Manual No. 54-1, it includes engineering drawings showing type of drain to use and how to install drains in standard types of roof construction. Roof drain outlet and sizing data are included. Several feature pages are devoted to special problems, such as snow and ice removal, sloughing drainage, and roof expansion and contraction protection. Drains and recommended drain arrangements for open deck parking areas are also shown. .....Item 140

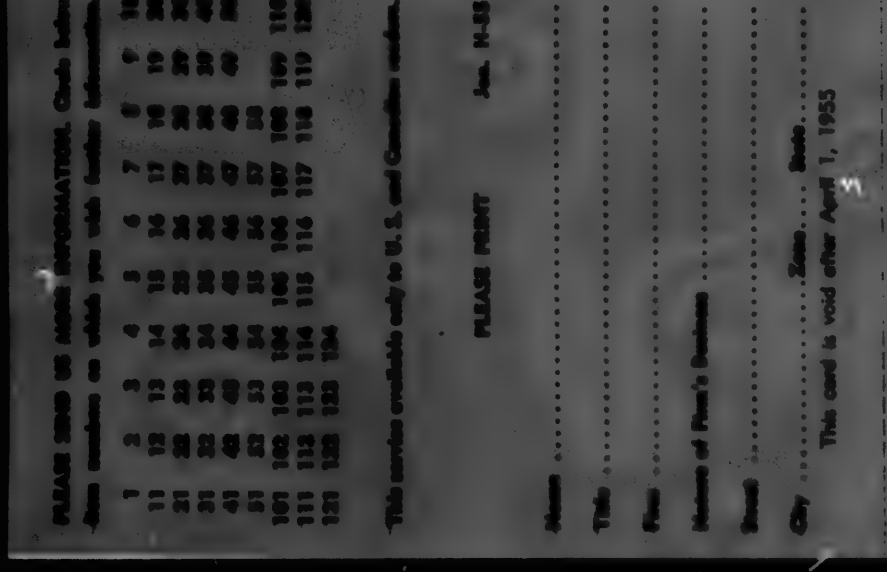
BULLETIN DESCRIBES LUBRICANT—Bulletin 104, a two-color, two-page circular which describes in technical detail its Molykote Microcoise lubricant, is available from The Alpha Corp., Stamford, Conn. Featured in the bulletin is a graphic picturization of the relative particle sizes of molybdenum disulfide powders in relation to their ability to penetrate the crevices of ground bearing surfaces. .....Item 141

BIG WATER HEATER DATA FREE PUBLIC HOUSING—The Record of Ruud Automatic Gas Water Heaters in Public Housing is a new 24-page brochure Form H210, issued by Ruud Mfg. Co., Pittsburgh, Pa., and which gives a factual and photographic record of domestic hot water service in 20 public housing project installations, coast-to-coast. Data are supplied on 20 individual housing projects using a total of 15,000 Ruud-Bionel automatic models for individual family use, and on seven other housing projects in which 112 of the company's multi-coil units were installed for central water heating. It also presents monthly recording of gallons of hot water used, gas consumption, and the cost of fuel on a per gallon, and a monthly basis. .....Item 142

[illegible] WITH INDUCED DRAFT FANS—The company's commercial steel boilers with Wing induced draft fans are pictured and described in a new 8-page catalog No. 575, available from The National Radiator Co., Johnstown, Pa. It points out that Wing induced draft fans, mounted on the boilers, offer a modern method of providing positive, adequate draft without requiring high, unsightly, and costly stacks. When the fan is used, stack need be only high enough to carry away or vent combustion gases. Specific examples are given where the induced draft fans are particularly advantageous, such as in garden-type apartments, airport buildings where high stacks create a hazard, for chimney made inadequate by the addition of heating equipment, and where there are problems of downdrafts, topography, and wind complications. Catalog shows drawings of the fans and their component parts, charts detailing mounting dimensions and space requirements, and wiring diagrams showing operations of the fans. The fans are ordinarily mounted to the boiler at the factory unless otherwise specified. .....Item 143

CONTROLS FOR VAPORIZING OIL BURNERS—A new 8-page condensed catalog of its oil controls and accessories is issued by A-P Controls Corp., Milwaukee, Wis. The catalog illustrates and describes the company's line of controls for vaporizing oil-burning appliances with manual and thermostatic operation. These controls can be used on space heaters, floor furnaces, water heaters, furnaces, oil burners, trailer heaters, ranges, etc. An easy-to-use selection chart lists 26 different basic types of constant level valves with copy identifying the application for each valve. In addition, all thermostatic control accessories applicable to each valve are listed on the chart. A thorough coverage of the many different types of accessories used to convert a manually operated heater to thermostatic operation is also listed on two pages. Also shown are attachments which will provide safety control of combustion fans. .....Item 144

REFRIGERATION SERVICE PARTS REFERENCE CATALOG—A complete refrigeration service parts reference catalog has been published by Brunner Mfg. Co., Utica, N. Y. Featured in the catalog are exploded views of all the company's compressor parts to facilitate ordering of replacement parts. Among the suggestions in the introduction of the parts catalog in reference to ordering replacements parts is the order of complete assemblies wherever possible. The company is endeavoring to keep these assemblies in stock for immediate shipment. The price for this refrigeration parts list and price list is fifty cents plus postage.



for Rust-Free Hot Water

look for the
Copper Lining
they did at this
SEALTEST PLANT

Pure, rust-free hot water is a *must* for dairy operations. For that reason, the men responsible for specifying hot water heaters for Supplee-Wills-Jones Milk Company in Philadelphia decided many years ago on **p-k** copper-lined hot water storage heaters as the best bet against corrosiveness in water.

For this plant, five **p-k** hot water heaters have been used for processing, cleaning, sterilizing and for general utility purposes. Recent examination of these heaters discloses no sign of corrosion. Copper linings remain bright and unpitted. Maintenance? Just routine.

A **p-k** Copper-Lined storage heater combines the non-corrosive properties of copper with the outstanding strength of steel . . . a complete, copper heater built inside of and reinforced by a heavy steel shell.

For an unfailing source of pure, rust-free hot water,

LOOK FOR THE **p-k** Copper Lining

Comprehensive catalog gives you all the facts. It's yours for the asking.

the **Patterson-Kelley Co., inc.**
910 Burson Street, East Stroudsburg, Penn.

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.

NEWS OF THE MONTH

RESEARCH REACTOR

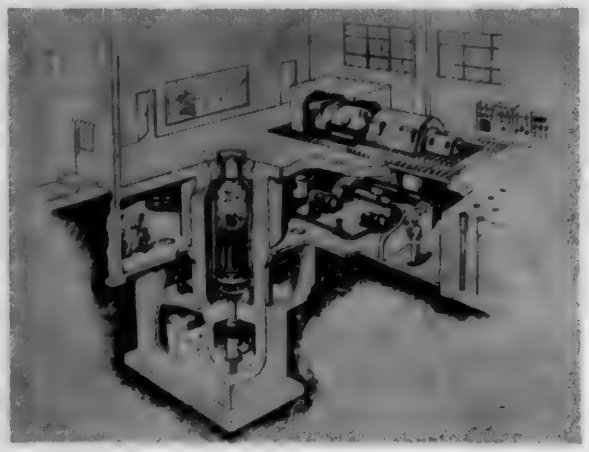
of boiling water type to be constructed as part of five year development program.

Argonne National Laboratory, operated for the U. S. Atomic Energy Commission by the University of Chicago, has announced plans for construction of an experimental boiling water reactor which has been authorized as part of the commission's five-year program for development of competitive electrical power from nuclear fuel. Sargent & Lundy, Chicago, Ill., has been selected as the architect-engineer for the project, while Allis-Chalmers Mfg. Co., Milwaukee, Wis., has been chosen to design, develop, construct, and install the power generation, heat transfer, and special equipment for the power cycle.

• **BACKGROUND.**—Development and construction of the reactor follows promising investigations conducted by the Argonne research staff during the past two years, during which a small temporary reactor converted water into steam directly without the use of an intermediate heat exchanger. These studies, as well as other investigations being conducted at Argonne, are aimed at producing electrical power from nuclear fuel at a price that will permit economical use of atomic fuel to supplement conventional fuels in meeting the nation's demand for energy.

• **REACTOR.**—The illustration shows an artist's conception of what the experimental boiling water reactor will look like when complete. The tall cyndrical tank in the center of the picture is the pressure vessel which has been cut away to reveal uranium fuel assemblies and water being converted into steam. The steam is carried to the turbine and electric generator in the upper right part of the picture. The control room can be seen to the left of the generator. The condenser, in which steam leaving the turbine becomes water again, and pumps for returning this water to the reactor, are below the turbine and generator. The holes in the concrete on the right are for storing highly radioactive, partly used fuel elements, pending disposal. The advantages of a boiling-water reactor over the more conventional circulating-water reactor are that the steam generator normally required for pressurized water reactors is eliminated, pumps can be much smaller and less expensive, because the only pump requirement in the primary circuit is that of returning water from the condenser to the reactor vessel, the reactor will be operated at a lower pressure and lower maximum temperature than pressurized water reactor systems, thereby simplifying fuel and structural materials problems.

• **POWER SYSTEM.**—Allis-Chalmers, under its contract, will develop components of a power system provided with special sealing devices which will make the components tight against leakage of steam, air, or water. The development of power plant components from which leakage of primary steam and water is held to virtually zero is desirable from an operating standpoint. In addition, such a development will make possible the use of heavy water (D_2O) instead of light water (H_2O), in the boiling water system. Heavy water possesses important nuclear advantages but it is expensive. The cost of power from nuclear plants might be reduced significantly by using heavy water if techniques for eliminating the leakage of the heavy water can be perfected.



Artist's conception of what the experimental boiling water reactor will look like. Tall cylindrical tank in the center is the pressure vessel which has been cut away to reveal uranium fuel assemblies and water being converted into steam for the turbine and electric generator in the upper right. Control room is to the left of the generator. Condensor and pumps are below the turbine and generator. The holes in the concrete on the right are for storing highly radioactive, partly used fuel elements, pending disposal.

• **OBJECTIVES.**— The experimental boiling water reactor is to be a small scale pilot plant, and the electricity produced will not be competitive with power from large central-station plants. The reactor with its power plant is one of several projects of the program recently announced by the Atomic Energy Commission for the peacetime development of atomic energy to produce industrial power. The information gained from its construction and operation is expected to contribute toward the goal of commercal nuclear power.

ATOMIC ENERGY BRIEFS

• The Atomic Energy Commission has authorized a nuclear power study by a newly formed association of nine companies known as the Rocky Mountain Nuclear Power Study Group. This study is the sixteenth currently authorized under the AEC's industrial participation program. The group is composed of the following companies: Arizona Public Service Co., Ebasco Services, Inc., Fluor Corp., Ltd., Idaho Power Co., Minnesota Mining & Mfg. Co., Public Service Co. of Colo., Riley Stoker Co., and Utah Power and Light Co. The group will study at its own expense the economic and engineering possibility of a nuclear power reactor for the western United States. It

(*Continued on page* 152)

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Pre-assembled metal and material pulls out FLAT, ready to fabricate

FOR FLEXIBLE duct connections, Silent Duct is tops from every angle. It costs about half as much as attaching material to metal in your own shop... helps you land business in a competitive market. It's a *standard* product; absolutely uniform in construction; outstandingly strong and dependable. It's made in your choice of 24 or 26-gauge galvanized steel fastened to either fire, water and mildew-resistant UL approved canvas (Govt. Spec. MIL-D-10860), Johns-Manville asbestos, (wire-filled, if desired), or U.S. Rubber Co. Neoprene coated fibre glass.

Elgen Silent Duct is delivered in 100-foot* (approx.) coils in a handy dispenser carton... *pulls out flat as a pancake* and you only have to cut *one* thickness of metal! Order Silent Duct from your jobber and write us for free folder that tells the whole Silent Duct story. Elgen Manufacturing Corporation, Dept.E-1, 41-34 39th St., Long Island City 4, N. Y. *50-foot coils with asbestos are available

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BLOWER & FORGE CO.
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ATOMIC ENERGY BRIEFS

(*Continued from page* 150)

will first study the feasibility of a reactor, cooled and moderated by light water, fueled with slightly enriched uranium, and designed for the purpose of producing both power and fissionable material. The group will then study the economic feasibility of other reactor types.

• Two projects for the development of nuclear propulsion for large naval vessels have been announced by the AEC and the Dept. of Defense. Research and development work on a reactor suitable for large ship propulsion has been assigned to Westinghouse Electric Corp. and separate design studies of large nuclear-powered ships have been undertaken by the Newport News Shipbuilding and Dry Dock Co., and Bethlehem Steel Co. The pressurized water reactor type has been selected for this project.

• In a speech delivered before the New England Council, Boston, Mass., Lewis L. Strauss, chairman of the U. S. Atomic Energy Commission stated that the New England area could be restored to its bygone position of industrial pre-eminence, with the development of atomic power by the industries located there. He outlined the ways in which the AEC is trying to foster such industrial initiative by the current 5-year reactor development program, which provides for completion of five reactors at the rate of one a year each representing a different type. In addition to the power reactors, Mr. Strauss told of the other reactors which are in various stages of development and operation around the country, and of the opportunity offered by the well known materials testing reactor which is available to industry for research in their own development work.

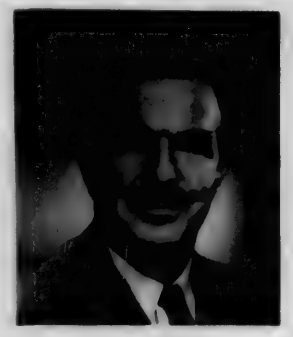
ASRE 50TH ANNUAL MEETING

held at Philadelphia, Pa. L. Buehler, Jr., elected president; R. C. Cross appointed executive secretary

Leon Buehler, Jr., chief refrigeration engineer, Creamery Package Manufacturing Company, Chicago, was installed as president of the American Society of Refrigerating Engineers at the annual convention of the society held at the Benjamin Franklin Hotel, Philadelphia, Pa., November 28 to December 1. This meeting marked the fiftieth anniversary of the society and the twenty-fifth anniversary of the Philadelphia chapter.

Leon Buehler, Jr.
President

• **OFFICERS.**—The other officers who took office at this meeting are: First Vice President, Carlyle M. Ashley, chief development engineer, Carrier Corp., Syracuse, N. Y.; Second Vice President, Hermann F. Spoehrer, vice president and treasurer, Sporlan Valve Company, St. Louis, Mo.; Treasurer, Cecil Boling, president, Bush Manufacturing Company, West Hartford. Conn.



C. M. Ashley
Vice President

H. F. Spoehrer
Vice President

The new directors to serve for three years are: Daniel D. Wile, vice president and chief engineer, Refrigeration Engineering, Inc., Los Angeles, Calif.; Gayle B. Priester, air conditioning engineer, Consolidated Gas Electric Light and Power Company, Baltimore, Md.; Harold M. Hendrickson, associate professor, Department of Mechanical Engineering, University of Washington, Seattle, Wash.; Justin Neuhoff, manager, Engineering, Commercial and Industrial Air Conditioning Department, General Electric Company, Bloomfield, N. J. Elected to serve as a director for two years was Joseph R. Chamberlain, chief engineer, Industrial Products, York Corp., York, Pa.

Cecil Boling
Treasurer

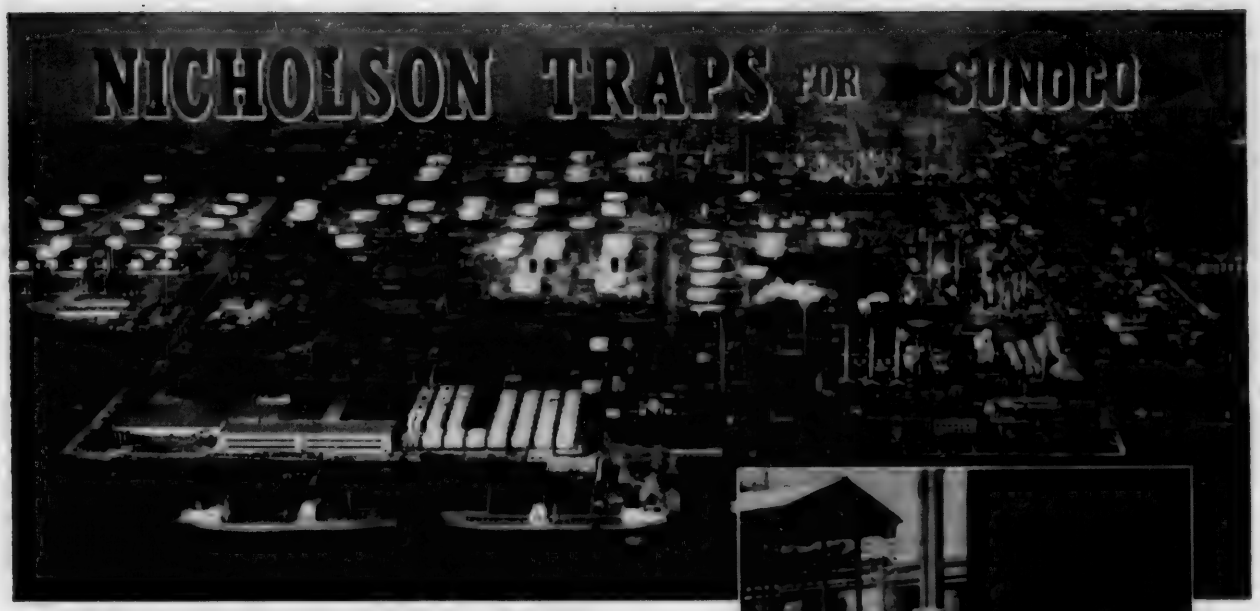
R. C. Cross
Executive Secretary

• **LUNCHEON PROGRAM.**—At the luncheon, a life membership certificate for outstanding service was presented to Dr. Donald K. Tressler. As part of the fiftieth anniversary ceremonies, a time capsule was sealed and presented to representatives of Franklin Institute with instructions that it is not to be opened until fifty years from date when the society will be celebrating its one hundredth anniversary. The capsule contains, among other items, the latest roster of the society, a tape recording of the various talks given as part of the anniversary luncheon program, and microfilms of the 36 section charters.

• **PROGRAM.** — The program was the most extensive ever planned for an annual convention. It consisted of four technical sessions, conferences on the domestic refrigerator, air conditioner, water, engineering education, research, and dessicants. In addition there were seven forums

(*Continued on page* 154)

NICHOLSON TRAPS FOR SUNOCO



Air view of Sun Oil Company's refinery at Marcus Hook, Penna.

Standard for

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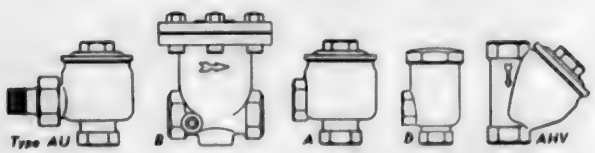
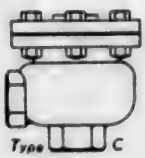
Feature

Nicholson steam traps are shown above installed on storage tanks requiring heating at Sun Oil Company's Marcus Hook, Pa., refinery. Sun has standardized on this type of installation.





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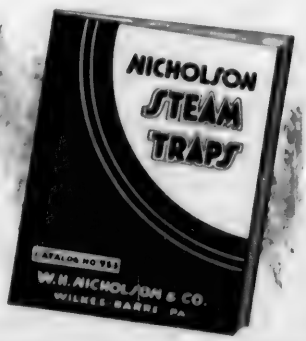

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ASRE MEETING

(*Continued from page* 152)

on the following subjects: Problems involved in the storage of frozen foods; moisture and non-condensibles in refrigeration systems; what properties should a refrigerant have to meet industry's needs?; thermodynamics of lithium bromide water solution for absorption systems; problems encountered with air conditioning load calculations; oil circulation in refrigeration systems; and centrifugal compression of refrigerants.

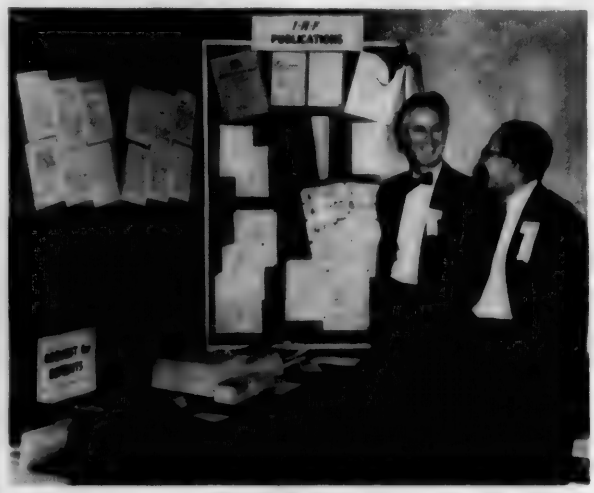
M. C. Turpin, with ASRE for nearly nine years, becomes secretary emeritus. His former position as executive secretary is now filled by R. C. Cross, a graduate of Northeastern University. Mr. Cross was assistant manager of the merchandise testing and development laboratories of Sears, Roebuck and Company. Before that he was fuel engineer with Batelle Memorial Institute, and assistant fuel engineer with the Bureau of Mines.

• **AWARDS.**—Winners of the three ASRE awards were announced. The Wolverine award was presented to F. Rasoni, consulting engineer, Montreal, Canada. The award for the best paper was made to J. R. Holmes, chief engineer, Harrison Radiator Works, General Motors Company. Winner of the Klixon prize, a check for $100, is E. W. Scott, Westinghouse Electric Corp.

• **NEW MEETINGS**—Dates and hotels have been selected for the next three national meetings. For 1955, the spring meeting will be held June 12-15 at the Hotel Schroeder, Milwaukee, Wis.; winter meeting, November 27-30, Hotel Statler, New York, N. Y. The 1956 spring meeting is scheduled for June 3-6 at the Sheraton Gibson, Cincinnati, Ohio.

The Philadelphia meeting was attended by over 800 members, ladies and guests.

FOUNDATION AUTHORS VIEW BOOK DISPLAYS

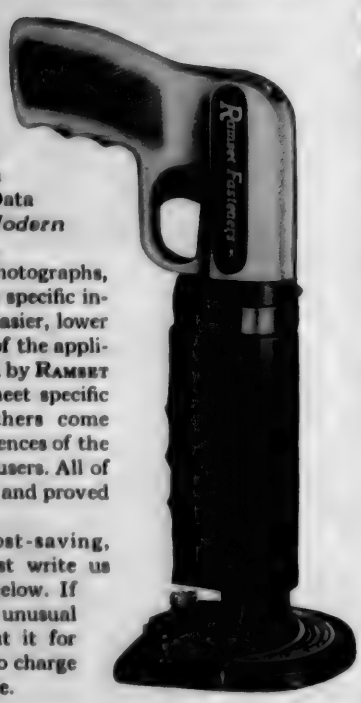


Authors W. C. L. Hemeon, left, and T. F. Hatch, engineering director and research adviser, respectively, of the Industrial Hygiene Foundation, look over displays of their new books at the November meeting of the Foundation. At top left are sample pages of Plant and Process Ventilation, by W. C. L. Hemeon, published in January, 1955 by The Industrial Press. Bottom left is announcement of McGraw-Hill's second edition of Industrial Dust, by Mr. Hatch and Phillip Drinker.

(*More news on page* 156)

CONTROL YOUR COSTS with PROFIT ENGINEERING

Days of down time, hours of tedious labor, can be saved by using the practical suggestions for fastening into steel and concrete, contained in RAMSET Application Data Sheets and booklet, *Modern Fastening Methods*.



Detailed drawings, photographs, and cost analyses give specific instructions for faster, easier, lower cost fastening. Many of the applications were developed by RAMSET Profit Engineers to meet specific conditions. Many others come from successful experiences of the thousands of RAMSET users. All of them have been tested and proved on actual jobs.

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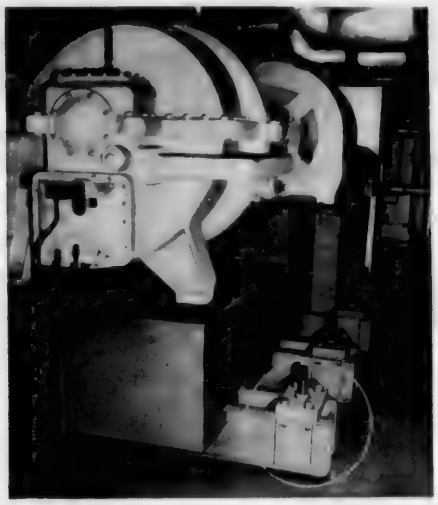
A feature of the Cafritz Building in Washington, D. C., makes it possible to drive your car up a series of ramps, and park it outside your office door.



The Cafritz Building, Washington, D. C.
LeRoy L. Weiner *Architect*
William A. Brown *Consulting Engineer*
Cafritz Construction Company *Builder*
Mehring & Hanson Company *Mechanical Contractors*

Another feature is this 530 Ton Centrifugal Refrigeration Machine installed on the roof. Korfund Steel Spring Vibro-Isolators with adjustable leveling bolts (a Korfund feature for over 30 years) made this installation possible, since they completely prevent vibration and noise transmission even to floors directly below. This makes available more revenue-producing space elsewhere in the building.

This is just one of hundreds of successful upper floor installations of heavy air conditioning equipment on Korfund spring isolators. Only Korfund Vibro-Isolators allow really heavy upper floor installations without floor reinforcement and with positive assurance of vibration and noise control.

Utilize all possible revenue-producing space — move air conditioning equipment upstairs. Korfund experience makes it possible. There is no substitute for experience.

For more information, write for your copy of Bulletin 23, or see our catalog in Sweet's Files.

See us at Booth 548 Air Conditioning Show Philadelphia January 24-28

For specific recommendations, contact us or your local Korfund Office. Look under "Korfund" in your local Telephone Directory or Thomas' Register. A half-century of experience is at your disposal.

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DOERR Motors **solve problem** on Bush Jet Coolers

Ceiling Jet Unit Coolers, a product of the Bush Manufacturing Company, of West Hartford, Connecticut, have the responsible job of maintaining continuous low temperatures in cold storage rooms. This calls for reliable motor operation, usually in the presence of high humidity.

The Doerr 1/10 hp, 1140 rpm, Type C, permanent split capacitor motor selected had to be suitable for replacement in existing units in the field. The band mounting used restricts the frame diameter and height is also at a premium. The unusual method shown for mounting the capacitor provided the answer and has simplified assembly in both production and in servicing.

This is another instance where Doerr has helped with a special design. If you have an unusual motor problem, please let us hear from you.

Visit us in Booth C-121, Heating & Ventilating Exposition, Philadelphia, January 24-28.

YOU GET **MORE** with DOERR!

DOERR Electric Corporation
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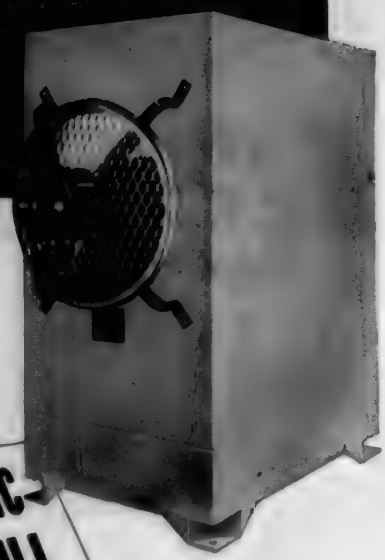
Electric Motors from 1/30 to 5 hp. Standard or designed to your specifications.

COOLING TOWER
by
KRAMER



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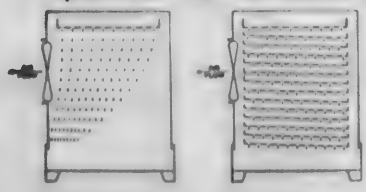
MORE CAPACITY
The redistributing decks keep the water uniformly suspended, providing maximum contact between air and water.

LONG LIFE
Casing and sump are heavy gauge steel, hot dipped galvanized after fabrication. Redistributing decks are metal and fireproof.

EASY INSTALLATION
Unit is shipped assembled but can be knocked down to eliminate rigging costs. One fitting required for drain and over-flow.



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ENGINEERING SOCIETY

changes name to emphasize air conditioning as part of heating and ventilating technique.

By a heavy total vote of 4081, a majority of 5919 eligible voting members of The American Society of Heating and Ventilating Engineers expressed their approval of changing the name of the sixty-year old engineering society to American Society of Heating and Air-Conditioning Engineers, Inc. The tellers report showed 3280 in favor, 654 opposed, and 147 invalid.

The new name, as decided at a special meeting November 22 in New York, has been filed with the Secretary of State of the State of New York to be effective as of Nov. 23, 1954. President L. N. Hunter emphasized that under its new name the membership will continue in professional work related to heating, air conditioning, ventilating and cooling, and the allied arts and sciences.

ECONOMISTS' REPORT

predicts moderate overall upturn in business activity in 1955. Consumer, wholesale prices seen rising.

Moderate improvement in business activity is the consensus of reports by 186 of the nation's top economists polled by F. W. Dodge Corp. in its annual opinion survey of the 1954-55 outlook. More than three fourths of the economists replying expect total activity, measured by gross national product, to be higher than the current rate in each quarter of 1955; and in general, they expect the trend during 1955 to show a steady rise until the end of the year.

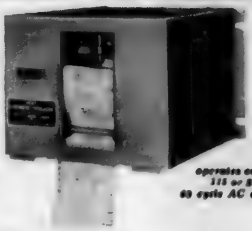
● **ANALYSIS.**—Analyzing the results, Dr. George Cline Smith, Dodge economist, noted that the prevailing opinion was moderate, however, with the average level forecast for the end of 1955 only 2% above the most recently reported level for 1954. "This forecast could be interpreted as meaning virtual stability," Dr. Smith said, "since the rise is so slight; yet an underlying element of strength appears in the fact that three out of four economists do predict a steady, if gradual, increase."

● **WAGES AND PRICES.**—Consistent with their view of gradual increase in total output in 1955, Dr. Smith reported, the majority of the economists also indicate a small rise in the Federal Reserve Board's index of industrial production and in consumer spending. An overwhelming majority of the economists felt that the cost of living would remain stable throughout 1955. A total of 128 out of the 186 replying predicted that the consumer's price index at the end of 1955 would range about one per cent above or below the current level. A somewhat smaller majority made a similar prediction with respect to wholesale prices. The average forecast was that both consumer and wholesale prices at the end of the year would be approximately at current levels. A large majority felt that hourly wage rates would rise during 1955 but they were fairly evenly divided on the question of

(*Continued on page* 158)

makes a record of job performance!

HEAT RECORDER-TOTALIZER



Convince your customers
satisfy yourself
that the job is right!

operates on either 115 or 230 volts 60 cycle AC current

The HEAT RECORDER-TOTALIZER furnishes all the data you could get watching the heating plant 24 hrs.-a-day with stopwatch, pad, pencil and adding machine.

In addition to marking on a chronological tape the time the heat went on, how long it was on, when it went off, etc., the HEAT RECORDER-TOTALIZER adds up on the totalizer meter the total "ON" time.

No chart to change daily! One tape roll lasts almost a heating season. The HEAT RECORDER-TOTALIZER operates electrically — in any plant, large or small. Use it from job to job — or better yet, make it part of the installation . . . it's priced so low! *write for detailed literature A*

Assures intelligent and efficient plant operation. Saves its cost many times in fuel, repairs, maintenance!

$55. TRADE PRICE

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Mfrs. of HEAT-TIMER electronic controls, Heat Recorder-Totalizer, Thermovalve, Varivalve, Motorized Valves, Smoke-Eye Smoke Alarm, Fire-Chief Fire Alarm

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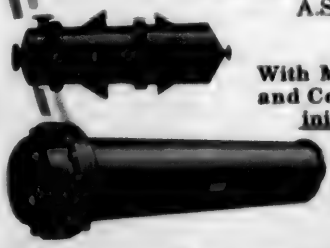
Top quality design and construction assure you of long life, plus low operating and maintenance cost with Manning & Lewis heating or cooling equipment.

Standard sizes and models are available for most applications, as well as being furnished of material for normal operating service. Special conditions will be satisfied by M & L engineers upon information submitted by mail or directly to our field representatives.

Heaters or coolers will be supplied to A.S.M.E. code requirements upon request.



With Manning & Lewis Heating and Cooling equipment "The initial cost is the last cost."

Literature pertaining to the above equipment immediately available upon your request.

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COOLING TOWER NEWS

This Binks Series 3-B forced draft cooling tower provides more than ample cooling for the 160 tons of air conditioning needed for this university chapel...and does it extremely quietly.

Quietness and compactness win contract for Binks Cooling Tower

Leading Southern University picks Series 3-B Tower for chapel roof.

These modern forced draft, low silhouette, cooling towers featuring the dry blower air propulsion system, are designed for use where high cooling efficiency is demanded, combined with whisper-quiet performance and compactness. Squirrel cage blowers supply ample air movement at tip speeds far less than the usual noisy propeller-type fans.

High cooling efficiency is obtained due to thorough water break-up from Binks patented Rotojet nozzles, combined with internal redwood nailless decking. They also feature counter-current operation with air movement in opposite direction to downward water flow.

Heavily galvanized, these towers reduce maintenance to a minimum. Interior surfaces are fully sprayed with a tough mastic coating. The air propulsion assembly is located in the dry air stream to protect it from corrosion.

Series 3-B towers are completely shop fabricated, ready for easy assembly.

FOR FULL INFORMATION write for Bulletin 477...or see us in Booth 236 at the Air Conditioning Exposition in Philadelphia, January 24 thru 28.

The compact design and low silhouette of this tower keeps it out of sight from street level.

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REPRESENTATIVES IN PRINCIPAL U. S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

ECONOMISTS' REPORT

(*Continued from page* 156)

whether average weekly hours worked would go up or down.

• **CONSTRUCTION AND OVERHEAD.**— Three fourths of the economists predicted that plant and equipment outlays next year would be below this year's level currently estimated by the government at $26.7 billion. The median forecast for next year was $26.0 billion. In the construction field, the median forecast was for a slight drop toward the end of next year below levels prevailing this year for total construction outlays, with total non-farm housing starts next year at 1,116,000, about 2% below the level estimated for this year.

• **NON-ECONOMIC FACTORS.** — Two non-economic factors occupied a position of some importance in the basic assumptions underlying the forecasts, according to comments made by many of the respondents. These two factors were the international situation and the political situation. So far as can be determined from the comments, none of the group assumed that all-out war was in prospect, or that defense expenditures would be greatly increased or decreased during the coming year. Many comments, however, referred to the possibility of changes in defense outlays. Several comments called attention to the possible effects of last month's election. It is impossible to draw any conclusions as to prevailing opinion from these comments, but they do serve to indicate that many respondents considered the political situation as one of the unknown factors involved in current economic forecasting.

HEATED STREETS

featured in Christmas festival in Brussels.

The expanding air-conditioning industry should be looking with envy toward little Belgium. It has attained an objective the industry has long sought. It heated its whole Rue Neuve in Brussels with infra-red radiation for the Christmas festival which brightened the whole month of December. The official Belgian Tourist Bureau in New York modestly claims it to be the first centrally heated street in a European capital. France, Germany and Finland are joining in this

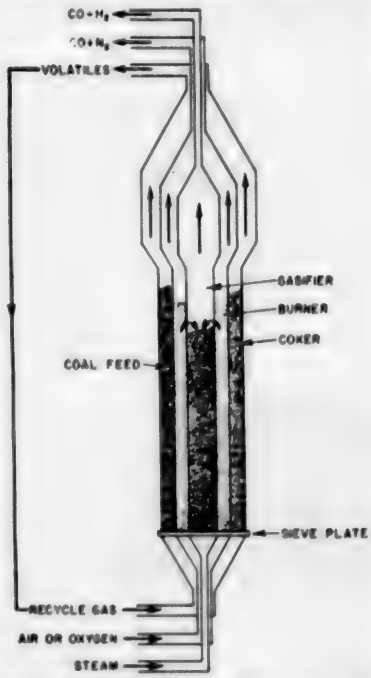
year's festival which, last year, drew 2,000,000 visitors. The bureau says there were more this year. Decorations and displays used 2,500,000 watts of electricity.

COAL GASIFICATION

under study at Washington U. to tap subbituminous sources.

A coal gasification pilot plant reactor, built under direction of the Chemical Engineering Department, University of Washington, is under study by the Engineering Experiment Station at the university. The study was prompted by the fact that the many problems concerning the economic utilization of low-grade carbonaceous fuels have tended to discourage the exploitation of large subbituminous coal deposits in the state of Washington. In view of the fact that these deposits have been estimated at 52 billion tons, or 5.26% of the United States reserves of subbituminous coal, the study could have far-reaching effects on the fuel picture.

• **DESIGN.**—The coal gasification pilot plant utilizes a hot coke heat-transfer system. The main part of the pilot plant consists of three concentric reactors constructed of type 302 stainless steel. The illustration shows



Coal gasification pilot plant now under study. Curved arrows indicate cycling of fluidized solid through small holes in reactor walls.

THREE THINGS TO CONSIDER in Selecting STEAM TRAPS

✓1. HOW MUCH CONDENSATE AT PEAK LOAD?

First determine how much condensate you'll have in the system at the peak load. When this is not known it can be easily figured by referring to the Anderson book "Solving Steam Trap Problems." However, to provide for a margin of safety the rating of the trap should be more than the condensate to be handled. The capacity rating factor should be at least two and sometimes as high as six, depending upon the steam condensing surface, the air to be vented as well as the type of trap used. By using Heat-Kwiks you never need a factor of more than 2 to 1. Therefore you get by with a smaller, less expensive unit.

✓2. HOW FAST MUST THE AIR BE VENTED?

It is desirable to heat up cookers, kettles, dryers, laundry and dry cleaning equipment, etc., quickly in order to increase production. Whenever this condition exists select Heat-Kwik Steam Trap. This trap vents air 8 times faster. The added production soon pays for the cost of the trap.

✓3. WHAT IS THE STEAM PRESSURE VARIATION?

When the pressure of a steam line drops off, the condensate-venting capacity of the conventional inverted bucket steam trap also falls off. Therefore if the pressure varies, choose a steam trap with a combination open float and bellows orifice . . . Heat-Kwik Steam Trap. The auxiliary bellows actuated orifice is unaffected by pressure.

Free! *36-page book "Solving Steam Trap Problems" shows how to select the right steam trap for any equipment. Write for your copy today.*

The V. D. ANDERSON Company
Subsidiary of Chesapeake Industries, Inc.
1973 West 96th Street, Cleveland 2, Ohio

SUPER-SILVERTOP
HEAT-KWIKS
the Engineered Steam Trap by
ANDERSON

the man on the job can tell you...

it pays to figure on

ALLENCO

INTERIOR FIRE-PROTECTION

"Allenco makes everything that might be called for in standpipe-type fire protection. Their prices and deliveries are reliable. Some of their items actually cut installation costs. Never had any trouble with them, and they're bringing out new things all the time."

V figure next job with **ALLENCO**

Established 1887

W. D. ALLEN MANUFACTURING CO.

710 Allenco Bldg. 566 West Lake Street Chicago 6

25 Sales Offices • New York 7

COAL GASIFICATION

the main section of the plant. As shown, the outside unit is the coker, next is the burner, and the center unit is the gasifier. The section diameters are 15, 10, and 5 inches, respectively, and the height from the expansion chamber to the sieve plate is 48 inches. Since the pressure drop in a fluidized bed is governed by the amount of material in it, and not by the velocity of the gas, coal will then be transferred at the bottom of the coker through holes into the burner, thence from the top of the burner into the gasifier and back into the burner at the bottom of the gasifier. Although some heat is transferred through the burner wall, the recirculating action of the hot carbon particles supplies most of it. The three concentric reactors are surrounded by a pressure shell and insulating section. This type of construction is to allow for future operation at elevated pressure up to 150 psig. Nitrogen or some other inert gas must be used as a pressure compensator to prevent the thin-walled unit from failing at high temperature and pressure operation. The coal feed hopper is constructed of steel and is also pressurized with nitrogen to prevent blowback through the feed screw. The feed rate is controlled by means of a variable speed motor. Since it is necessary to keep reactive gases from the coker section, the coker gas can be recycled as the fluidizing medium for the coker bed. This requires cooling the gas for pumping and then preheating it before it reenters the coker. The burner and gasifier beds are fluidized by air and/or oxygen, and steam respectively. Transversing chromel-alumel thermocouples are used to record temperatures at different points in the reactor bed. Pressure drop at various points across the reactor determines the height of the fluidized beds. Analysis of gas streams is accomplished by means of standard orsat equipment. It is believed that the unit is capable of automatically carbureting a fuel gas from 250 to 450 Btu per cubic foot.

• **OPERATION.**—In preparing coal for the plant in tests run by the study group, only a fraction of from 20 to 100 mesh was used, so it was necessary to process a considerable amount of coal. The coal is first ground in a

(*Continued on page* 162)

National Champion

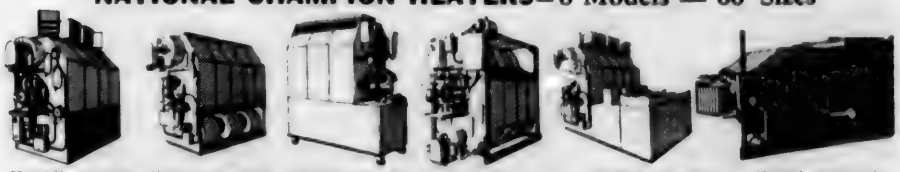
HAS THE POINTS THAT WIN!

Get the jump on your heating problem with National Champion Heaters! Whatever your heating need — space heating, tempering, make-up air, curing, drying or deicing — there's a National Champion to do the job. Check these winning points:

- 80% guaranteed heating efficiency
- Direct fired for gas, oil or combination fuels
- Completely automatic controls — for constant, clean heat
- 70%-150% more heat transfer area than similar units
- Quieter, smoother operation — lowest blower RPM
- Highest available external static pressures
- Electronic flame failure control
- Completely wired, assembled and flame-tested at the factory to guarantee peak performance
- Listing by Underwriters' Laboratories, Inc.

Teardrop design Combustion Chamber of National Champions

NATIONAL CHAMPION HEATERS—6 Models — 66 Sizes



Model H—vertical unit with discharge heads. 12 sizes.

Model D—vertical unit for dust work. 12 sizes.

Model P—portable, vertical unit for flexible duty. 6 sizes.

Model R—inverted unit with discharge heads at bottom. 12 sizes.

Model S—vertical unit with side blowers to permit proper location of air mixing dampers. 12 sizes.

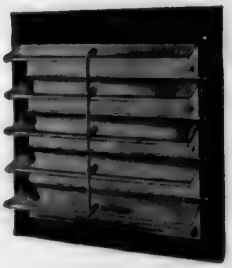
Model C—horizontal ceiling suspension unit for space saving. 12 sizes.

Write today for complete information and specifications.

NATIONAL HEATER COMPANY, INC.
2180 Charles Avenue, St. Paul 4, Minnesota

Elgo Ventilating Specialties

FAMOUS AUTOMATIC SHUTTER



Unusually sensitive to air currents, causing the louvers to open instantly when the fan is turned on—and snap shut when the fan is turned off.

The aluminum louvers are weatherstripped. The best fitting shutter on the market.

Sizes from 12" to 72" square also rectangular.

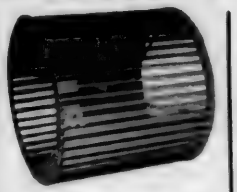
"Echo" Automatic Ceiling Shutters

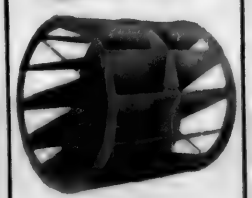
Used for attic ventilation. Installed in attic floor at the base of a penthouse, the louvers being operated by the suction of the fan.

Free Catalog

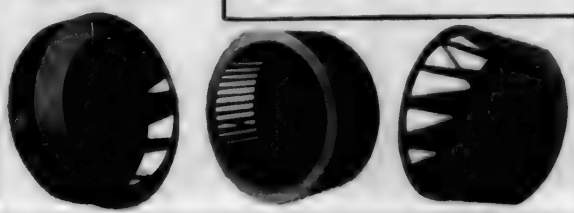
ELGO SHUTTER & MFG. CO.
2738 W. WARREN, DETROIT 8, MICH.

BARRY *Industrial* **BLOWER WHEELS**





Built to your specifications. All types heavy duty wheels — single inlet, double inlet, forwardly curved, and backwardly curved — all sizes 6" to 72" diameter. Welded or riveted construction. Prompt deliveries. BARRY blower wheels are precision built, expertly trued, and perfectly balanced by specialists for long, smooth service. Send specifications for quotation, performance data, etc. to BARRY BLOWER CO., 3110 California St. N. E., Minneapolis 18, Minnesota.



Nothing like new

G-B SNAP-ON

glass fiber pipe insulation!

Molded in one piece with single seam.

Anyone can carry feather-light 6′ sections.

Just spread seam snap over pipe join seam with staple.

Paint if you like. No mud or dust no clean-up time no breakage . Sizes ¾-33″ for hot or cold* piping. Picture the savings.... Then write today for samples and details.

Be sure to see these products at BOOTH 740, A.S.H. & V.E. SHOW . . . or write for information!

gb GUSTIN-BACON

Manufacturing Company

222 W. 10th St., Kansas City, Mo.

COAL GASIFICATION

(*Continued from page* 160)

hammer mill and then classified through a special screener. It is necessary to preheat the reactors to 1000 deg F in order to ignite the coal particles. This is accomplished by introducing air and city gas into the burner and igniting the mixture. When the temperature of the burner exceeds 1000 deg F, the steam and recycle streams are introduced, and the coal feed turned on. If the temperature continues to rise, the gas is shut off. The plant is now on stream, and flow conditions can be adjusted to obtain the desired temperature. The temperature is controlled by the amount of oxygen admitted into the burner section. Shutdown is accomplished by introducing nitrogen in the burner and turning off the air supply. This is continued until it is certain that the reactor is below the clinkering point.

• **CONCLUSIONS.**—Although the oxygen consumption of the pilot plant is quite high, the plant exhibits high thermal, carbon, and ash efficiencies. Carbon efficiencies and size of fly dust can be altered since they depend primarily upon size of coal feed and gas velocity through the bed.

Test data on the gasifier are given in a report by George A. Kennar and R. W. Moulton in the October Quarterly of the Engineering Experiment Station, University of Washington.

SUMMER COOLING

at low cost in combination with water and steam systems discussed.

New methods of obtaining low cost, more efficient summer cooling for residences in combination with forced hot water and steam heating systems dominated discussions at the semi-annual meeting of the Institute of Boiler and Radiator Manufacturers held in Absecon, N. J., recently.

• **NEW METHODS.**—A report on the Institute's research program included announcement of a new low installation price of $1000 for the complete installation of an integrated chilled type summer cooling system for medium sized homes. The Institute states that this marks the first time that the cost of such systems has been brought down to a level competitive with that

SUMMER COOLING

for other types of summer air conditioning. The methods which helped reduce the cost include new techniques of calculation, design and installation of year-round heating-cooling systems. Developed under the research program, they emphasize more accurate calculation of cooling loads or the amount of heat to be overcome in a home, and more precise sizing of equipment as the best means to lower costs and more efficient operation.

• **OTHER DEVELOPMENTS.**—Other new new developments include findings drawn from operation of a new forced water heating-cooling system installed in a research home at Urbana. These tests showed that lower operating costs resulted when smaller size units were run continuously in the home, as compared to the intermittent operation of larger units. Also, they showed that a satisfactory cooling job could be done with only two accurately sized units as against the six units called for under the old-style method of calculating cooling loads. This finding led to an estimated reduction of nearly 50% in equipment and installation costs, and to the estimated cost of $1000 for addition of summer cooling to the heating system. Units employed were so-called forced convectors which heat as well as cool. The system may be combined with cast iron or fin-tube baseboard heating units, either in new or existing homes. Another finding reported was that smaller units running continuously produced more uniform temperatures, avoiding fluctuations, and a lower relative humidity inside the house, than did the larger units running intermittently.

• **COMMITTEE REPORTS.**—Among reports from the Institute's 20 committees, which are composed of industry engineers and executives, were new recommendations for reducing stack heights and the cost of chimneys in ranch-type and other one story homes, with no loss of heating efficiency; for improving the performance standards and tests for heating equipment, including indirect heaters for domestic hot water; and for approving applications for official I-B-R ratings for cast iron boilers, baseboards and fin-tube radiators.

(*Continued on page* 164)

Nothing in the world like

ULTRALITE

Duct Insulation and Liner!

ULTRALITE Duct Insulation and Duct Liner are the only flexible glass fiber duct insulations with a 6-year record of performance. A few feet of ULTRALITE Duct Liner reduces equipment noise to a whisper. Vapor-barrier faced ULTRALITE prevents condensation. Both can be fastened in place with adhesives or other simple means. Thermal and acoustical efficiency is higher ....applied costs are lower!

Be sure to see these products at BOOTH 740, A.S.H. & V.E. SHOW . . . or write for information!

gb GUSTIN-BACON

Manufacturing Company

Thermal and acoustical glass fiber insulations • Pipe Couplings and fittings

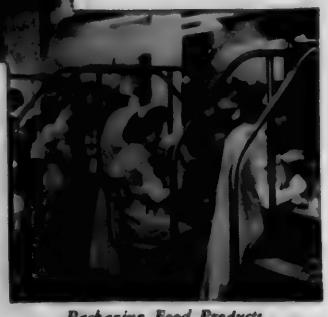
Molded glass fiber pipe insulation

222 W. 10th St., Kansas City, Mo.

A NEW more reliable air conditioning method

with exact moisture control FOR YOUR PROCESS OR PROTECTION FOR TESTING PRODUCTS OR MATERIALS AT ANY TIME OF THE YEAR

Assembling Electronic Parts



Packaging Food Products

Drying Industrial Material

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

Write for Bulletins 112 and 122

NIAGARA BLOWER COMPANY

Dept. HV, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

SUMMER COOLING

(*Continued from page* 163)

• **FUTURE PLANS.**—Plans for the future will emphasize increased attention by the Institute to sales and sales promotion; closer operation with the air conditioning and related industries; further development of sound standards for heating equipment; increased research; and attention to advanced training in heating and cooling. Reporting on progress of the industry, the Institute's current chairman, Robert S. Waters, announced that overall sales of forced hot water and steam heating systems were ahead of last year. Commenting on the future possibilities for the industry, Mr. Waters predicted "a striking change in the design of heating equipment, particularly boilers, baseboards and fin-tube radiators." This is being forced, he said, "by sales considerations brought about by an increasingly competitive market". Mr. Waters noted that, in the past, equipment design stemmed primarily from engineering considerations, while today those of a sales nature are being added rapidly. He stated that new products now undergoing test and development may revolutionize year-round air conditioning systems as we know them today.

NEWS BRIEFS

• The F. Paul Anderson Medal, highest award of The American Society of Heating and Air-Conditioning Engineers, has been awarded to Charles S. Leopold, prominent Philadelphia heating and air conditioning consulting engineer. In making this announcement for the Society, L. N. Hunter, president of the organization and vice president of the National Radiator Company, said that Mr. Leopold had been nominated for this high honor because of his outstanding contributions to the advancement of human comfort in the fields of heating, ventilating and air conditioning.

• In conjunction with its industrial hygiene program, the Institute of Industrial Medicine, New York University Post-Graduate Medical School, is offering two courses designed to deal with some of the basic problems encountered by those concerned with the control of environmental hazards. These courses were planned to be of particular interest to industrial hygienists, safety engineers, industrial physicians, insurance representatives and others in the field of occupational health and safety. The courses are given in cooperation with the University's College of Engineering and will be held at the Engineering School during the spring semester.

• A three-day Industrial Ventilation Conference, sponsored jointly by the New York State Labor Department's Division of Industrial Hygiene, and Rensselaer Polytechnic Institute in Troy, New York, will be held at the Institute on January 31 and February 1-2, 1955. Designed to increase knowledge of industrial exhaust systems which comply with the New York State Industrial Codes, the conference will also include lectures by personnel from the medical and chemical units of the Department's Industrial Hygiene Division. Main emphasis, however, will be on exhaust system design. Basic engineering lectures will be given by experts of the Engineering Unit of the Division of Industrial Hygiene.

Ad-Digest SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

NOTE: While every attempt is made to list all advertisements, those which are received after the published closing date may not appear. The Index of Advertisers lists all the advertisements in this issue.

REFRIGERATION PRODUCTS. Inside back cover. This company offers a full line of valves, strainers, driers, and gages. You pay no premium for the extra advantages found in these products. Catalogs available. ..... Item 201

COPPER WATER TUBE. Page 143. Radiant panel heating fits perfectly into the growing trend to one-story school construction and the ideal material for panel heating is copper. Use of this copper water tube means easy bending and handling, its long lengths require fewer fittings, and the solder fittings used eliminate need for welding, wrench work, and thread cutting. Technical advisory service available. ..... Item 202

VIBRATION CONTROL. Page 133. This company's vibration isolators allow heavy upper floor air conditioning equipment installation without floor reinforcement and with positive assurance of vibration and noise control. Bulletin available. ..... Item 203

AIR CONDITIONING UNITS. Page 72. Low ceilings cannot be furred down to hide the duct work necessary for most air conditioning systems. However, this company's system does not require bulky ducts. One pipe carries chilled or hot water from a centrally located plant to each individually controlled unit in a building. These units condition the air through finned coils, and circulate it through the room. Information available. ..... Item 204

CONDENSING UNITS. Page 65. Whether it's a room air conditioner, a large package unit, or a huge factory system, this hermetic compressor is recommended. It is available in air cooled types from ¼ through 3 hp and in water cooled types from 1/3 through 7½ hp. Condensed catalog available. ..... Item 205

COOLING TOWER. Page 154. This company's cooling tower has more capacity because the redistributing decks keep the water uniformly suspended, providing maximum contact between air and water. Casing and pump are of heavy gage steel, hot dip galvanized after fabrication. Unit is shipped assembled but can be knocked down to eliminate rigging costs, 3 to 8 ton capacities. ..... Item 206

UNIT HEATERS. Page 32. For over 25 years, this company has paced the field in unit heating. Every model provides perfect heating comfort plus lowest possible fuel cost. This balanced heating is the result of discharge temperatures of 110 to 130 degrees being correctly related to heat throw and air volume. Bulletin available. ..... Item 207

VENTILATION. Page 175. Where the problem is ventilation, the solution is this company's system. This company's rotary ventilators, with or without fans, can do the most for you. A 2 mph wind operates this company's rotary and it continues to exhaust during wind lulls due to superior balance design. Information available. ..... Item 208

AIR HANDLING AND CONTROL. Page 24-25. A wide selection of grilles and air diffusers of all types. Such features as opposed-blade volume control and air flow balancing devices; air turning equipment; adjustable ceiling outlets, and high velocity air valves. Control line includes both electric and electronic controls including zoning controls, hot water controls and control centers. Catalogs available. ..... Item 209

AIR CONDITIONERS. Page 171. Room units which cool with cold water from a central chiller, heating with hot water from a central boiler. They also ventilate. In console, concealed, built-in overhead, and ceiling types. Bulletin available. ..... Item 210

COOLING TOWERS. Page 70. A new packaged double-flow tower delivered to the job in three basic sections, each completely pre-assembled at the factory so that at the site the sections can be assembled with a minimum of labor or equipment. Information available. ..... Item 211

STEAM TRAPS. Page 138. Now a large oil refinery is using this company's traps in outdoor use where they are freeze-proof. Manufacturer has standardized on this type of installation. Company makes six types of traps for process, heat and power. Catalog available. ..... Item 212

MOTORS. Page 74. This company's type RK capacitor-start motor is the right kind of motor for your single phase applications. It is available in a frame resilient mounting or in a rigid base type with thick rolled steel frames and long life centrifugal switch. Bulletin available. ..... Item 213

COPPER TUBE. Page 43. Copper tube for soil, waste, and vent lines means a neater, faster installation. Time is saved on the installation as well as on the final pressure testing. Comes in long 20 foot lengths, requires fewer joints, is light, and eliminates pipe threading. Bulletin available. ..... Item 214

AUTOMATIC TEMPERATURE CONTROL. Page 18-19. Harvard University is another distinguished user of this system of temperature control which are found in many buildings on the campus, including Lowell House, Dunster House, McKinlock Hall, Vanderbilt Hall, Littauer Building, Aldrich Hall and Gordon McKay Laboratory. Information available. ..... Item 215

AUTOMATIC HEATING EQUIPMENT. Page 35. A single dependable source for automatic heating equipment, including packaged steam boilers, horizontal rotary oil burners, packaged oil or gas combustion systems, pump and heater sets oil heating systems, and draft controls. Bulletins available. ..... Item 216

WROUGHT IRON PIPE. Page 7. In Atlanta this wrought iron pipe has stood the test of time for 54 years in the Citizens & Southern National Bank Building, 51 years in the Biltmore Hotel, 64 years in the Trust Company of Georgia Building, 71 years in Kimball House, 39 years in Sears, Roebuck and Company, and 58 years in the Georgia Savings Bank Building. Corrosion costs you more than wrought iron. Bulletin available. ..... Item 217

POWDER POWER TOOL. Page 68. A fast acting system of drive pins and explosive cartridge action for fastening duct work to steel or concrete features an exclusive break-open action of the holding tool and a single standard powder charge regardless of penetration desired. Cannot be discharged accidentally. Air conditioning ducts installed in a Miami hotel in record time with this tool. Literature available. ..... Item 218

VENTILATORS. Page 173. This company's ventilators are made in both blower or propeller types. The units are easy to install, are all aluminum, have a low silhouette and their motor is sealed from the air stream. Catalog available... Item 219

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Circle below item numbers on which you wish further information.

201	202	203	204	205	206	207	208	209	210	211	212	213	214
215	216	217	218	219	220	221	222	223	224	225	226	227	228
229	230	231	232	233	234	235	236	237	238	239	240	241	242
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271	272	273	274	275	276	277	278	279	280	281	282	283	284
285	286	287	288	289	290	291	292	293	294	295	296		

PLEASE PRINT Jan. AD-55

This service available only to U. S. and Canadian readers

Name..... Title.....

Firm .....

Nature of Firm's Business.....

Street .....

City..... Zone..... State.....

This card is void after April 1, 1955

Ad-Digest SERVICE

AIR FILTERS. Page 54. Whether you need filters for packaged air conditioners or furnaces, for general filtration or for special applications requiring the highest efficiency and greatest dirt capacity, this company has a standard type to fit the job. Available in steel, aluminum, copper, stainless and monel. Information available.....Item 220

PIPE INSULATION. Page 61. An unusual pipe insulation which installs itself in that it is poured on underground pipe, tamped and backfilled, and the job is insulated. The heat in the pipe fuses the insulation to the pipe resulting in an underground pipe insulation at low cost. Available in three grades. Literature available.....Item 221

EXTENDED SURFACE. Page 145. Extended surface heat exchange equipment for heating, cooling, process and air conditioning. Your local representative's recommendation means high efficiency, long service life, and low maintenance costs. Information available.....Item 222

FABRICATION SERVICE. Page 178. By eliminating numerous flanged joints and combining several fittings into one integral unit, this company's pipe fabrications assure greater efficiency and real economy from the simplest to the most complex layout. Bulletin available.....Item 223

SHUTTERS. Page 161. An automatic shutter unusually sensitive to air currents, causing the louvers to open instantly when the fan is turned on and to snap shut when the fan is turned off, and an automatic ceiling shutter for attic ventilation are included in this line. Catalogs available.....Item 224

COOLING TOWERS. Page 145. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungis and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in this company's cooling towers is protected against these twin enemies. Creosote, with 162 elements toxic to fungus growth and parasites, also makes wood more resistant to chemical attack. Information available.....Item 225

REFRIGERATION. Page 176. This low velocity unit cooler for food processing and storage is designed especially to conserve space, maintain proper temperature, produce even air motion, and reduce shrinkage. Ideal for multiple unit installations. Information available.....Item 226

AIR CLEANER. Page 69. Random thoughts of a filter engineer are presented in this interesting advertisement and covering a new idea in washing electrostatic precipitators, a discussion of whether self-cleaning filters stay clean, and a discussion of electrostatic filters.....Item 227

HEAT RECORDER. Page 147. An instrument which furnishes all the data needed for determining operation of heating plant. It records on a tape the time the heat went on, how long it was on, and when it went off. Instrument also adds up on the totalizer the total "On" time. Literature available.....Item 228

VANEAXIAL FANS. Page 171. Designed for maximum operating performance and low-cost maintenance, these fans are available in 12 to 48 inch diameters for capacities to 77,000 cfm. Folder available.....Item 229

AIR HANDLING EQUIPMENT. Page 10-11. This company is a single source for a line of ceiling diffusers, high pressure diffuser units, grilles and registers, recessed and free standing convectors and baseboard radiators.....Item 230

STEEL PIPE. Page 48. This pipe has seven points of uniform goodness—The uniformity applying to ductility, length, threadability, weldability, wall thickness and size, strength and toughness, roundness and straightness.....Item 231

THERMOSTATIC CONTROLS. Page 74. This company's Type S thermostatic temperature regulator is designed for automatically regulating the flow of liquid or steam through a valve, such as in, for example, a dairy which is illustrated. This company's line of regulators, mixing valves and controllers are performance tested.....Item 232

PACKAGED BOILERS. Page 42. Two reasons why this boiler lasts longer and makes steam costs less are the two-pass design providing even flow of combustion gases to all heating surfaces and, second, the heating surfaces are arranged so that there is a centrally located furnace and equal spacing of return tubes. Bulletins available.....Item 233

PIPE HANGERS. Inside front cover. There is a stock hanger of this make for every piping requirement from a simple water pipe to a high pressure, high temperature steam line. Where necessary, there are engineered hangers to compensate for thermal movement. Information available.....Item 234

BOILERS. Page 42. Planned as perfectly integrated units, three matched boiler burner units are shown as made in cooperation with three burner manufacturers by this nationally known boiler manufacturer. Each has 8.2 square foot of heating surface per boiler horsepower in strict accordance with the Steel Boiler Institute Code.....Item 235

WALL EXHAUSTERS. Page 170. Duct costs can be saved by using these wall exhausters which permit the exhausters to be connected directly to the ventilated area. This is particularly helpful in multi-story building design. Bulletin available.....Item 236

WATER HEATERS. Page 149. Copper lined water heaters supply rust-free hot water for the Supplee-Willis-Jones Milk Company in Philadelphia, rust-free water being a must for dairy operation. These copper lined storage heaters combine the non-corrosive properties of copper with the outstanding strength of steel. Catalog available.....Item 237

ROOF VENTILATORS. Page 163. You are assured of dependable ventilation when you specify these roof ventilators of which there is a type, size, and capacity for all your requirements. Line includes propeller fans, centrifugal fans, stationary, rotary, and ridge roof ventilators and accessories. Catalog available.....Item 238

DUCT CONNECTOR. Page 151. A product designed for making flexible duct connections and delivered in 100 foot coils in a handy dispenser carton. It is made in a choice of 24 or 26 gage galvanized steel, fastened to canvas, asbestos or neoprene fiber glass. This enables fabricators to cut costs. Folder available.....Item 239

DIRECT FIRE HEATERS. Page 174. A feature of this line is simplicity of accessability, no dismantling being necessary because all the accessories are mounted outside the heater. Available for gas, oil, coal, or dual gas and oil.....Item 240

COOLING TOWERS. Page 152. A leading Southern University picked this company's cooling tower for its chapel roof due to its extreme quiet. It provides more than ample cooling for the 160 tons of air conditioning. High cooling efficiency is obtained by patented nozzles combined with redwood decking. Bulletin available.....Item 241

DUST FANS. Page 1. These duct fans exhaust fumes at top efficiency by avoiding a directional change in the air stream. Fan motor stays clean, cool and accessible. Fumes are by-passed or bifurcated from the exhaust stream. Available in sizes from 12 to 48 inches in diameter. Bulletin available.....Item 242

BLOWER WHEELS. Page 141. Heavy duty industrial blower wheels either forwardly or backwardly curved in sizes from 6 to 72 inches in diameter.....Item 243

STOKERS. Page 41. These stokers, automatically controlled and with power-operated dumping grates, are being used for efficient firing of the boilers in the new Prudential Home Office Building in Chicago. Two 40,000 pound and one 22,000 pound per hour steaming capacity boilers are to be used. These stokers burn all bituminous coals, lignite and wood. Catalog available.....Item 244

PUMPS. Page 51. A new addition to this company's line of motor pumps—one designed specifically for air conditioning applications. Features include top hydraulic performance, small size and light weight, mechanical seals, easy hand rotating for start-up and competitive price.....Item 245

Postage Will be paid by Addressee

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FIRST CLASS PERMIT NO. 33, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

NOZZLES. Page 67. A new peak in spraying efficiency is obtained with these non-clog nozzles. Available in either cone spray or fan spray types. The former is most popular for cooling, recooling, washing, rinsing, air conditioning and similar operations, the latter being particularly desirable for surface washing. Cone type available in three types. Spray nozzle bulletin available .....Item 248

HEAT PUMP CONTROLS. Page 21. This company's automatic control is used on the various heat pump installations in Portland's Equitable Building which provides air conditioning at less than half the average cost of other office buildings. Outdoor master thermostats, step controllers, and submaster thermostats are used in this building .....Item 247

HOT WATER VENTING. Page 55. A comprehensive line of fully automatic air valves for hot water heating systems, including types for water heater convectors in both horizontal and vertical types, baseboard radiation, free standing radiators and hot water piping in general. Accessories and repair parts also available. Catalog furnished .....Item 248

AIR CONDITIONING DEALERS. Page 56. This company has 1955's big opportunity for dealers in its packaged air conditioners with a five-year warranty and waterless air cooled air conditioners in 2, 3, 5, and 7½ h.p. sizes. Advertisement includes an appeal from the vice president in charge of sales for dealers to get in touch with him .....Item 249

PACKAGED BOILERS. Page 30. Continuous satisfaction with a 150 hp unit of this make by a Mid-West meat packing plant led to the addition of a 250 hp gas-fired unit. Savings with this boiler start with compact, simplified installation and, once installed, its features keep right on saving in fuel. Bulletin available.....Item 250

SOUND CONTROL. Page 26. Packaged silencing units which fit directly in the duct work, saving time and money on installation costs. One seven foot unit reduces noise level below what 100 feet of duct lining could accomplish and with low pressure drop. Constructed of galvanized steel or aluminum and available in nineteen standard sizes for use with all styles and sizes of ducts and in eight types to meet any desired condition. Information available .....Item 251

TANKS AND TANK LINING. Page 169. This company is a specialist on tank fabrication at low cost and on tank lining of various types. Literature available .....Item 252

VENT SETS. Page 151. Ventilating sets available as packaged units, furnished ready to run after bolting to foundation and connecting to duct work. Available in sizes from 700 to 10,000 cfm capacity and for indoor-outdoor mounting. Bulletin available.....Item 253

RADIATOR TRAPS. Page 2. A survey of 51,816 of this company's radiator traps showed an average of 30.5 years of service and still going strong. The maintenance costs per year per unit was 2.6 cents. Furthermore, 20,280 of these traps averaged less than 0.5 cents per trap or less than a penny a year. Available in ¼, ⅜ and 1 inch sizes in diaphragm or bellows type. Catalog available.....Item 254

MOISTURE CONTROL. Page 164. A method of controlling humidity where heating and cooling functions are completely separate from adding or taking away moisture. This assures a precise result. At normal atmospheric temperatures it needs no summer re-heat, making it inexpensive to operate. Bulletins available.....Item 255

AIR HANDLING EQUIPMENT. Page 20-21. A comprehensive line of heating and ventilating and dust control equipment including unit heaters, unit ventilators, blowers, propeller fans, heating and ventilating units, dynamic precipitators, hydro-static precipitators, electrostatic precipitators, dust collectors, as well as dry, replaceable, renewable, and washable air filters. Company invites readers to visit their five booths at the Philadelphia show....Item 256

DUCT FURNACE. Page 23. A new sectional duct furnace, gas-fired, which represents a new concept in duct heating equipment. The furnaces are assembled on the job of four basic sections and include heat exchangers with components for air moving, cooling, cleaning, and humidification. Capacities range upward in steps of 50,000 Btu from 150,000 to over 2,000,000 Btu per hour. Bulletins available.....Item 257

AIR CONDITIONERS. Page 55. Both air-cooled and water-cooled air conditioning units for residential and commercial air conditioning in sizes from 2 to 5 tons capacity. .....Item 258

RADIANT HEATING. Page 50. Radiant heating has been widely adopted in churches due to its gentle sun-like warmth without drafts or dead spots. Steel pipe is most accepted medium for radiant heating systems. Advertiser offers 48-page booklet on radiant heating.....Item 259

POWDER FASTENERS. Page 154. How your costs can be controlled by powder actuated fasteners for fastening into steel and concrete. Data sheets and bulletin available.....Item 260

CENTRIFUGAL COMPRESSORS. Page 76-77. In actual operation at the 12th International Heating and Ventilating Show in Philadelphia, will be this company's 300 ton hermetic centrifugal compressor that meets smaller load requirements by automatically throttling down to as low as 10% rated capacity. Also shown will be the company's room air conditioners, zoned conditioners, unit ventilator, unit heaters, water chillers, coils and convectors. .....Item 261

CONDENSING UNITS. Page 12. Featured is this company's refrigeration condensing units for remote air conditioning installation in commercial and industrial applications in sizes up to 75 hp with capacity control. Compressor units for use with evaporative condensers are also available up to 75 hp. Information available. Item 262

PIPING SYSTEMS. Page 73. This company's prefabricated insulated piping systems are designed for underground and overhead distribution of steam, condensate return, and hot and chilled water. The systems are designed and constructed of quality materials, time tested and test proven. Information available.....Item 263

Use this Digest to locate and refer to advertisements appearing in this issue of AIR CONDITIONING, HEATING AND VENTILATING, then fill out and mail the prepaid postcard to request further information.

AIR HANDLING UNITS. Page 171. Air handling units in 24 different sizes for pinpoint selection to give closely controlled balance of system. Condensers available from 2 to 60 tons capacity. Company also makes multi-zoned units, packaged air conditioners, evaporative condensers, cooling towers and blast coils. Catalog available. .....Item 264

REFRIGERATION EQUIPMENT. Page 40. Condensed descriptions and illustrations of this company's line of liquid chillers and heat pumps, all metal cooling towers, small tonnage condensers of the shell and tube type and shell and coil type and large tonnage condensers for Freon or ammonia. When the job is to chill water, the system can be planned with this company's line. .....Item 265

WALL RADIATION. Pages 46-47. A new line of along-the-wall radiation for commercial, industrial and institutional buildings. It can be one, two or three tiers high for steam or hot water and of steel and non-ferrous elements. It is flush mounted along the wall by positioning the hanging strip. Element support is attached to the strip, element hung, and one-piece cabinet mounted. Company's bulletin available. .....Item 266

AXIAL FLOW FANS. Page 82. A complete line of axial flow fan equipment, including bisected, upblast roof fans, bisected duct fans, bisected hooded roof fans, axial flow impellers, tube-axial duct fans of either belt drive or direct drive, upblast roof fans, and hooded roof fans. Catalogs available. .....Item 267

SUPPLY HEATERS. Page 58. When air is exhausted from spray booths or other plant operations it must be replaced by heated fresh air. These fresh air supply heaters supply make-up air properly heated and require no expensive duct work. The coils cannot freeze because steam pressure is on at all times. Information available. .....Item 268

VENTILATING FAN. Page 68. This fan sets a new standard in quiet, efficient performance. Is available in capacities from 1,000 to 500,000 cfm. Its "Q" factor (built-in quality) makes it your safest fan to specify. Bulletin available. .....Item 269

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Circle below item numbers on which you wish further information.

201	202	203	204	205	206	207	208	209	210	211	212	213	214
215	216	217	218	219	220	221	222	223	224	225	226	227	228
229	230	231	232	233	234	235	236	237	238	239	240	241	242
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271	272	273	274	275	276	277	278	279	280	281	282	283	284
285	286	287	288	289	290	291	292	293	294	295	296		

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Name..... **Title**.....

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Nature of Firm's Business.....

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City..... **Zone**..... **State**.....

This card is void after April 1, 1955

Ad-Digest SERVICE

VENTILATOR AND DIFFUSER. Page 13. Two new products of this company are a centrifugal roof ventilator which provides a low contour for today's low buildings of the parapet type. It is all aluminal construction. Available in sizes from 200 to 6,000 cfm. A new air diffuser, ceiling type, has a deep plate which eliminates all ceiling smudging and makes use of anti-smudge cones unnecessary. Available in a full range of sizes. Item 270

AIR HANDLING EQUIPMENT. Page 12. This company's line includes circular, square, rectangular and centrifugal diffusers, exhaustors, and high velocity air filters. They are designed to provide dependable operation with minimum maintenance. .....Item 271

OIL-FIRED UNIT HEATERS. Page 173. Just out is a new colorful catalog on this company's line of oil-fired unit heaters. Available on request. .....Item 272

AIR HEATERS. Page 181. A line of large direct fired unit heaters for gas, oil or combination, with 80% heating efficiency, and completely wired and assembled at the factory. Available in six types. Information and specifications will be furnished. .....Item 273

WATER SAVERS. Page 73. You will find flexibility in these water savers available in these combinations: cooling tower with copper decking, with either propeller fan or blower fan; an evaporative condenser can be had by replacing the copper decking with a coil. With the cooling tower and evaporative condenser you will be astonished by the compact size....Item 274

FLUSH VALVES. Page 8. A feature of this flush valve is the renewable valve seat. With it, the valve will last the life of the building. In case of scoring or cutting, the seat can be easily replaced and the valve returned to service. Handbook available. .....Item 275

MOTORS. Page 186. Electric motors from 1/3 to 5 hp. Advertisement shows one of these motors as applied to a Bush ceiling jet unit cooler. Company invites questions or unusual motor problems. Item 276

FLEXIBLE HOSE. Page 169. A high quality reinforced spiral-wire hose designed for moving air, dust or fumes. It can be cut or coupled easily and can maintain large sections on sharp bends. Bulletin available. .....Item 277

FIRE PROTECTION. Page 169. It pays to estimate on this company's line of interior fire protection equipment. Company manufactures everything that might be called for in standpipe type fire protection. .....Item 278

BLOWERS. Page 37. Four new bulletins have been published by this manufacturer of fans and blowers on standard duty fans, heavy duty industrial fans, general purpose fans and forward curved fans. All are available. .....Item 279

AIR CLEANING. Page 57. A comprehensive line of air filtration equipment is made by this manufacturer, including electrostatic type with synthetic fiber media, another unit with a patented media and easy washing and exceptional dust holding capacity, a third of all aluminum for kitchen exhaust systems, a washable synthetic fiber type, a permanent one-inch filter in rust-proof aluminum, a self cleaning automatic and a reversible "soak-then-flush" type. Catalogs available. .....Item 280

PIPE INSULATION. Page 182. A line of snap-on glass fiber pipe insulation molded in one piece with single seam, in sizes from ¾ to 36 inches for hot or cold piping. Samples and details available. .....Item 281

DUCT INSULATION AND LINER. Page 163. A few feet of this duct liner reduces noise to a whisper. Vapor barrier faced insulation prevents condensation. Information available. .....Item 282

MOTORS. Page 37. A new stream-cooled line of fully enclosed motors which are easier to install, easier to handle and bring you modern efficiency and performance. Every detail of design and construction is calculated to reduce size and weight without sacrificing performance and efficiency. Information available. .....Item 283

SUCTION PRESSURE REGULATOR. Page 39. Any electric motor is safe from burn out cost by overloads if this suction pressure regulator is installed in the refrigerant suction line. It prevents a build up of pressure at the compressor. Bulletin available. .....Item 284

HEATING SYSTEMS. Page 48. These heating systems are available in five types with or without automatic control for institutional, commercial and public buildings. The system, with single dial control, tunes in with the weather to balance heat supply against heat loss. .....Item 285

AIR CONDITIONING AND REFRIGERATION. Page 172. The Indiana University medical center at Indianapolis has air conditioning and food service equipment furnished by this manufacturer including unit air conditioners. The company's compressors operate a chilled water air conditioning system, and seven fractional horsepower units serve food dispensing equipment while four 7½ hp units cool a dozen walk-in units. Bulletin available .....Item 286

WATER LEVEL CONTROL. Page 173. A boiler water level control which operates by magnetic force and available in single or multistage models for all boiler water control applications. Catalog available. .....Item 287

UNIT COOLER. Page 175. A ceiling type cooler for food processing and storage designed especially to conserve space, maintain proper temperature, produce even air motion, and reduce shrinkage. Folder available. .....Item 288

WELDING FITTINGS. Page 61. This company's pioneering research gives you more for your money. Distributors' complete stocks saves your purchasing time, research gives you advanced products, and company's engineering gives you cost-cutting ideas. .....Item 289

BLOWER CATALOG. Pages 16-17. A fast packed 36-page catalog on the company's backward curve blowers in sizes from 12½ to 36½ inches. Catalog lists performance ratings, shows variable speed ranges, and gives other engineering details. Catalog available. .....Item 290

CONTROL PRODUCTS. Back Cover. This company's advertisement is a highly condensed catalog showing illustrations and very brief descriptions of its water feeders, cut-offs, water level controls, relief valves, and affiliated products. Information available. .....Item 291

GLASS FIBER INSULATION. Page 44. This company's glass fiber insulation is said to give more acoustical value than any other. Advertisement shows how it is used on an air conditioning unit. In addition, it is extremely light-weight, is easily cut to shape, and is soft and flexible. Can also be used inside ducts. Sample and folder available. .....Item 292

HEAT TRANSFER EQUIPMENT. Page 157. Standard sizes and models of condensate coolers, water chillers, freon condensers, fuel oil heaters, converters and water heaters. Literature available. ....Item 293

OUTDOOR CONTROL. Page 36. A new outdoor control that is simpler than a thermostat and installs in an hour. Temperature bulb is outdoors, control unit indoors, provides more efficient heat and saves fuel on any system. Brochure available. .....Item 294

PUMPS. Pages 70-71. A comprehensive line of pumps including those for sewage handling, return line vacuum and boiler feed pump, condensation pump and receiver, circulating pumps, and double suction pumps. Bulletin available. .....Item 295

STEAM TRAPS. Page 159. Three things to consider in selecting steam traps are how much condensate at peak load, how fast must the air be vented, and what is the steam pressure variation. Use the answers to these to select your steam traps from the company's 36-page booklet "Solving Steam Trap Problems." Write for your copy. .....Item 296

Postage Will be paid by Addressee

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BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 81, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

140 LAFAYETTE STREET

NEW YORK 13, N. Y.

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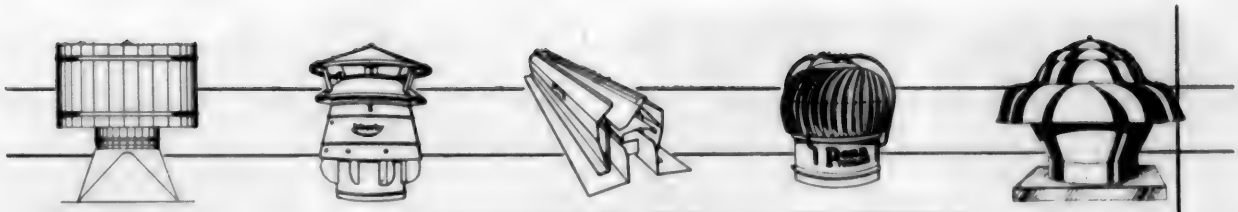

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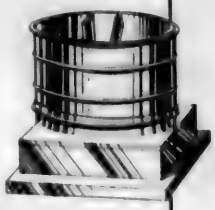
There is a type, size and capacity for all your ventilating requirements. Efficient and economical Penn Ventilators are easily installed and last long, providing years of trouble-free, inexpensive ventilation. They have been removing dust, vapors, smoke, heat, fumes and odors from public, commercial and industrial buildings for more than a quarter of a century.

Write for descriptive literature on the entire line . . . and for qualified recommendations and prompt quotations.

Manufacturers of: Propeller Fan — Centrifugal Fan, Stationary, Rotary and Ridge Roof Ventilators and accessory products. Representatives and distributors in principal cities.



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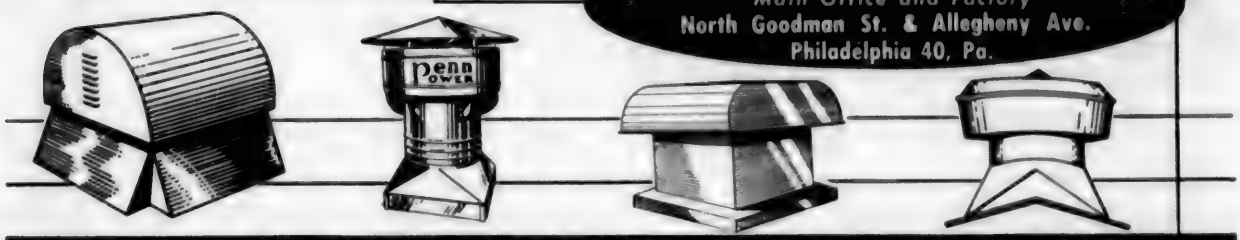
Main Office and Factory
North Goodman St. & Allegheny Ave.
Philadelphia 40, Pa.



FOR MORE THAN 25 YEARS THE BUILDERS' *roof* TOP LINE!

Cut Tank Costs

TWO COMPLETE SERVICES

TANK FABRICATION

Up to date automatic and semi-automatic production equipment in the hands of skilled craftsmen mean low initial costs. True economy is effected in the many added years of usefulness inherent in a Novelty product built to top-quality standards.

TANK LINING

Let our Novelon Lining Department offer their suggestions as a solution to your storage problem. Considerable savings are often possible by specifying a time-tested lining as an alternate to far more expensive steel alloys—with protection against corrosion guaranteed

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Solve your Problems in

Sizes 1¼" to 36" I.D.

AIR CONDITIONING
FUME CONTROL AND VENTILATION
DUST AND CHIP COLLECTION
MATERIALS HANDLING

with

FLEXAUST®

HOSE

The high-quality, reinforced, spiral-wire hose designed for moving air, dust, fumes, materials.

Here Are Cost-Cutting Advantages:

- **EASY INSTALLATION** — Unskilled labor can cut, couple or cuff Flexaust hose in a jiffy. It's so light, a child can lift it.
- **DURABLE, STRONG** — Flexaust hose is highly resistant to abrasives, aging, corrosion, moisture, chemical deterioration and flexing fatigue. It has a bonded, double ply, double overlap construction.
- **AIRTIGHT**—Ideal for pressure, suction, or gravity operations.
- **HIGHLY FLEXIBLE** — Can maintain large sections on sharp bends; won't kink or flatten.

WRITE TODAY for new bulletins on FLEXAUST hose and companion PORTOVENT® duct: Product Information • Accessories and Installation • Technical Data • Application Data.

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Distributors in Principal Cities

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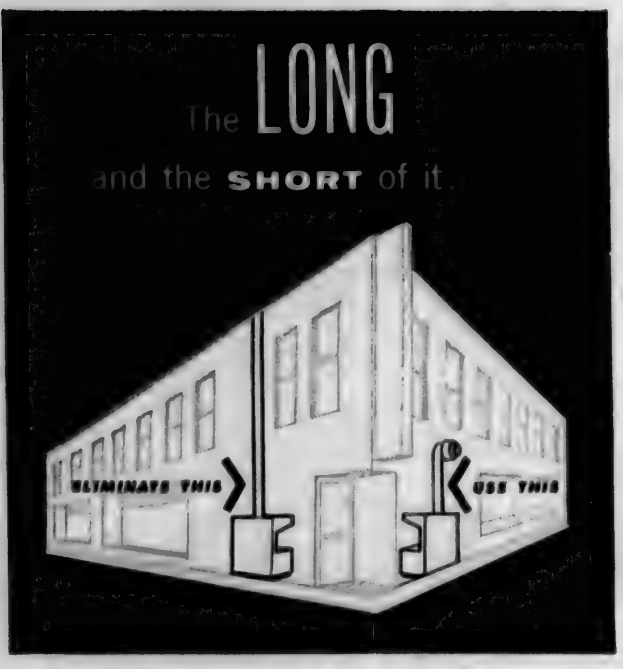


. . . HOW TO CUT DUCT COSTS

This is the story of how to save money on ventilating —the story of long duct runs vs. short ducts.

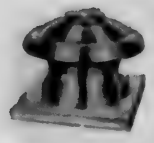
PROBLEM: To reduce long and elaborate duct runs connected to power exhausters—runs that often cost more than the heart of the system, the fan, itself. This problem is more acute in multi-story construction or existing structures where ducts are brought through upper floors to the roof.

SOLUTION: Use Jenn-Air Wall Exhausters . . . thus eliminating most duct work. One simple opening through the outer wall permits the Wall Exhauster to be connected directly to the area of ventilation. In this way valuable interior space is saved and installation costs are reduced.

The Long and Short of it on the Roof

JENN-AIR
Wall
Exhausters

Visit us in Booth 27 at the ASH & VE Show.



Jenn-Air Low-Contour Roof Exhausters

Design blends with today's buildings. Gone are unsightly penthouses, and gravity stacks. First with spun aluminum construction, Jenn-Air Exhausters are setting the trend in the field.

JENN-AIR PRODUCTS COMPANY, INC.

Architects & Builders Building
Indianapolis, Indiana

London Letter

(*Concluded from page* 121)

occupant could turn off his radiators and still obtain a useful amount of heat through the walls from his neighbours on either side. To prevent his getting heat for nothing there would have to be a two-part tariff with a high fixed charge. Then the unit charge would be so low as no longer to constitute a spur to economy. The fixed resistance can be adjusted so that the meter does not stop even with all radiators off. The only possibility of fraud left is for the occupant to cut the wires, and it is a simple routine for the meter-reader to check that this has not been done. If it is all that it is claimed to be, it may have a big influence on the future of district heating in Britain.

For the development of more schemes like the Pimlico estate the engineers must be assured that they will pay. The prospective tenants cannot value in hard cash the convenience and absence of dirt and smoke, because they have been laying, setting, drawing, mending, stoking and poking open fires since childhood. Say it will cost them eleven shillings a week for heat and hot water, and they turn it down and go live somewhere else. Say it will cost them so much a therm, with power to adjust their consumption and their costs, and that's a different pair of shoes; in a few months they are using more heat than ever before and perhaps paying fifteen shillings a week for it. And the whole scheme becomes a financial success.

There is no doubt the Pimlico scheme is a success from every other point of view. The tenants like it, and the general public know that the heat from Battersea is being used instead of increasing the pollution of the Thames. Three thousand dwellings and 11,000 people are such large numbers that the man in the street cannot appreciate that Battersea is still putting 98% of its waste heat into the river. Once it is grasped that the Thames is having the heat equivalent of some 4000 tons of coal poured into it daily from all sources, it cannot be believed that the effect of this on pollution is quite undetectable in comparison with the 400 million gallons of partially treated sewage that Londoners put in each day. And anglers are only just coming to realize that one of the biological processes that may well benefit from a modest increase in temperature is the breeding and growth of fish.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

SOLAR ENERGY SYMPOSIUM—A world symposium on applied solar energy, sponsored by Stanford Research Institute, Stanford, Calif. at the Westward Ho Hotel, Phoenix, Ariz. Chairman of the Institute, 612 S. Flower St., Room 332, Los Angeles 14, Calif. . . . . **JANUARY 12-15, 1955.**

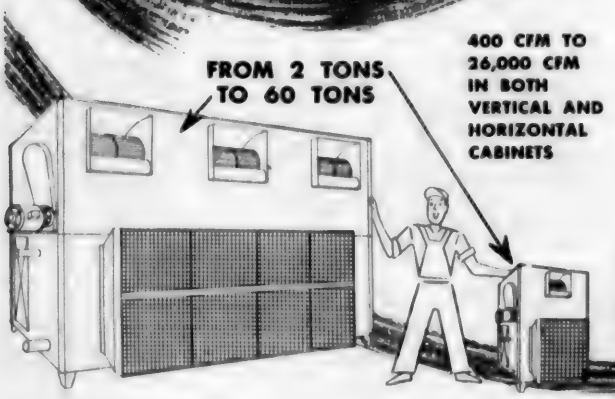
ASHAE MEETING—61st annual meeting of the American Society of Heating and Air Conditioning Engineers, Inc., at the Benjamin Franklin and Bellevue-Stratford Hotels, Philadelphia, Pa. A. V. Hutchinson, executive secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JANUARY 24-27, 1955.**

HEATING & VENTILATING EXPOSITION—12th International Heating & Ventilating Exposition, at the Commercial Museum and Convention Hall, Philadelphia, Pa., held under the auspices of the American Society of Heating and Air Conditioning Engineers, Inc. E. K. Stevens, International Exposition Co., 480 Lexington Ave., New York 17, N. Y. . . **JANUARY 24-28, 1955**

(*Concluded on page* 172)

AIR HANDLING UNITS

24 DIFFERENT SIZES FOR PIN-POINT SELECTION



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Choose exactly what you want with Governair Air Handling Units. Secure more closely controlled balance of system load by simple selection of air handling component. 24 complete and individual sizes for greater flexibility.

OPTIONAL GOVERNAIR FEATURES:

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- **Generously sized permanent and replaceable filter sections**
- **Mixing boxes**
- **Spray and pan type humidifiers**

Manufacturers of Multi-zoned Air Handling Units, Packaged Air Conditioners, Evaporative Condensers, Cooling Towers, Blast Coils, and many others. Write for complete information and specifications.

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Modine Airditioner

COMPARE before you buy!

Only Modine AIRditioners* offer so many extra quality features. Cooling with cold water from a central chiller . . . heating with hot water from a central boiler. Quiet operating, beautifully styled, AIRditioners are ideal for new construction or modernization. In console, concealed, built-in overhead, and ceiling types — each in 2/3, 1-1/2 and 2 ton sizes. A-1239

Get all the facts from the Modine representative listed in your classified phone book. Or write for free illustrated Bulletin 754.

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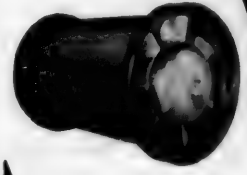


NEW Aerovent Vaneaxial FANS

for peak efficiency and economy in all higher static pressure ranges

Designed for maximum operating performance and low-cost, easy maintenance, Aerovent "Vaneaxial" Fans utilize specially constructed propellers and guide vanes to provide high-velocity, straight-line air delivery. Available in sizes 12" to 48" for capacities to 77000 CFM.

other models for every air-moving requirement

All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

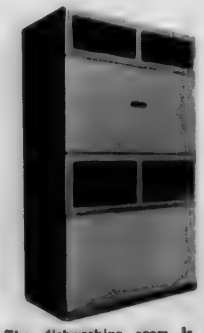
Ask for free folder V-501

Aerovent Fan Company, Inc.
Ash and Brandt Streets Piqua, Ohio

Fountain in the garden of the Student Union.

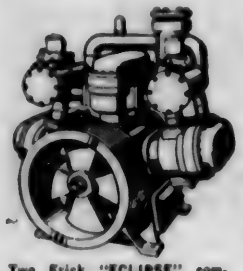
New Student Union Selects Frick Air Conditioning & Refrigeration

This fine building of the Indiana University Medical Center, at Indianapolis, comprises apartments, guest rooms, dining halls, swimming pool, etc.



The dishwashing room is air conditioned with a Frick unit, as are the X-ray areas at other places on the campus.

Here both air conditioning and food service loads are handled by 13 Frick refrigerating machines, and a Frick unit air conditioner. Seven fractional-horsepower units serve food-dispensing equipment, while four of 7½ horsepower each cool a dozen walk-in boxes. The Frick "ECLIPSE" machines operate a chilled-water air conditioning system. Installation by Hayes Bros., Inc., Distributors at Indianapolis and South Bend.



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WAYNESBORO PENNA U.S.A.

(*Concluded from page 170*)

TESTING MATERIALS MEETING—1955 spring meeting of the American Society for Testing Materials, at the Netherland-Plaza Hotel, Cincinnati, Ohio. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JANUARY 31-FEBRUARY 4, 1955.**

INDUSTRIAL VENTILATION CONFERENCE—The 14th Annual Conference for bringing together plant engineers, contractors and others interested in industrial ventilation, is co-sponsored by Michigan Department of Health, Division of Occupational Health, and Michigan State College, School of Engineering. Held at Kellogg Center, Michigan State College, East Lansing, Michigan. James C. Barrett, Ventilation Engineer, Division of Occupational Health, Michigan Department of Health, Lansing 4, Mich. . . . . **FEBRUARY 14-17, 1955.**

CORROSION ENGINEERS CONVENTION—Annual convention of the National Association of Corrosion Engineers, at the Palmer House, Chicago, Ill. A. B. Campbell, executive secretary of the Association, 1061 N&M Building, Houston 2, Tex. . . . . **MARCH 7-11, 1955.**

LUBRICATION ENGINEERS MEETING—Annual meeting and exhibit of the American Society of Lubrication Engineers, at the Hotel Sherman, Chicago, Ill. Wm. P. Youngclaus, Jr., secretary of the Society, 84 E. Randolph St., Chicago 1, Ill. . . . . **APRIL 13-15, 1955.**

OIL HEAT CONVENTION—33rd annual convention of the Oil-Heat Institute of America, tentatively set for the Conrad Hilton Hotel, Chicago, Ill. R. H. L. Becker, secretary of the Institute, 500 Fifth Ave., New York 36, N. Y. . . . . **APRIL 19-21, 1955.**

MECHANICAL ENGINEERS MEETING—Spring meeting of the American Society of Mechanical Engineers, at Lord Baltimore Hotel, Baltimore, Md. C. E. Davies, secretary of the Society, 29 W. 39th St., New York, N. Y. . . . . **APRIL 18-20, 1955.**

GAS APPLIANCE MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at the Ambassador Hotel, Los Angeles, Calif. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. . . . . **MAY 23-25, 1955.**

NDHA MEETING— 46th annual meeting of the National District Heating Association, at the Edgewater Beach Hotel, Chicago, Ill. John F. Collins, Jr., secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. . . . . **MAY 23-25, 1955.**

ASRE SPRING MEETING—Spring meeting of the American Society of Refrigerating Engineers, at the Hotel Schroeder, Milwaukee, Wis. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. . . . . **JUNE 12-15, 1955.**

TESTING MATERIALS MEETING—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia, Pa. . . . . **JUNE 26-JULY 1, 1955.**

INTERNATIONAL CONGRESS OF REFRIGERATION—Ninth International Congress of Refrigeration, sponsored by the International Institute of Refrigeration, to be held in the conference rooms of the Sorbonne in Paris, France. General Secretariat of the Congress, International Institute of Refrigeration, 177, Boulevard Malesherbes, Paris, France . . . . . **AUGUST 31-SEPTEMBER 15, 1955.**

INSTRUMENT SOCIETY CONFERENCE—Tenth Annual Conference and Exhibit of the Instrument Society of America, to be held at Shrine Exposition Hall and Shrine Auditorium, Los Angeles, Calif. John McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 33, Pa. . . . . **SEPTEMBER 12-16, 1955.**

ASRE WINTER MEETING—Winter meeting of the American Society of Refrigerating Engineers, at the Hotel Statler, New York, N. Y. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. . . . . **NOVEMBER 27-30, 1955.**

REFRIGERATION EXPOSITION—9th Exposition of the Air-Conditioning and Refrigeration Industry, at Atlantic City, N. J., sponsored by the Air-Conditioning and Refrigeration Institute. The name of this trade show, formerly known as the All-Industry Refrigeration and Air Conditioning Exposition, has been officially changed. George Jones, executive secretary of the Institute, 1346 Connecticut Ave., N. W., Washington, D. C. . . . . **NOVEMBER 28—DECEMBER 1, 1955.**

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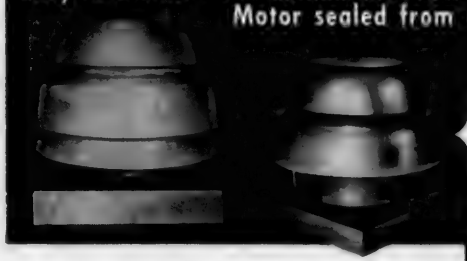

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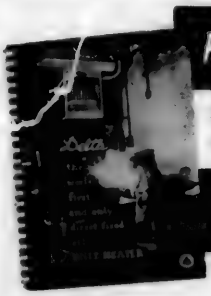

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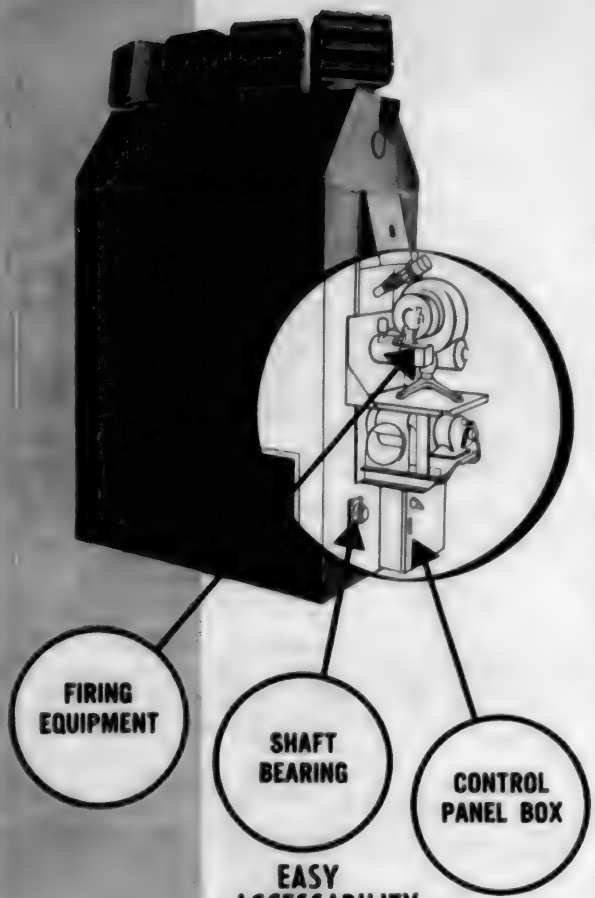

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What Would You Do?

(*Concluded from page* 124)

amine requires an additional small chemical feed pump for its injection into the main steam line.

Richard B. Conlan
Engineering Department,
W. H. & L. D. Betz

Philadelphia, Pa.

The following discussion refers to the problem in the previous issue regarding the possibility of noise developing in an air conditioning system that might be communicated to various offices:

In our work as consulting engineers, we employ several design methods and criteria for reducing the noise propagation and transmission by and from air handling equipment.

Noise produced in the equipment may be kept at a minimum by the following methods:

1. Select fans for low outlet velocities. We use, 2,000 fpm as a maximum on low static pressure systems and have never had noise problems from this source.
2. When the manufacturer makes a distinction, select "quiet" motors. Some motors will generate considerable windage noise.
3. Size ducts for low friction loss and low velocities. Generally speaking, the velocities obtained by sizing ducts for a maximum of 0.1 inch drop per 100 ft result in low noise levels.
4. Velocities through coils, filters, louvers and grilles should also be kept as low as possible, commensurate with available space and control requirements. Some manufacturers give velocity and corresponding decibel readings for some of these items.

The following methods may be used to minimize transmission of noise from equipment to the occupied space:

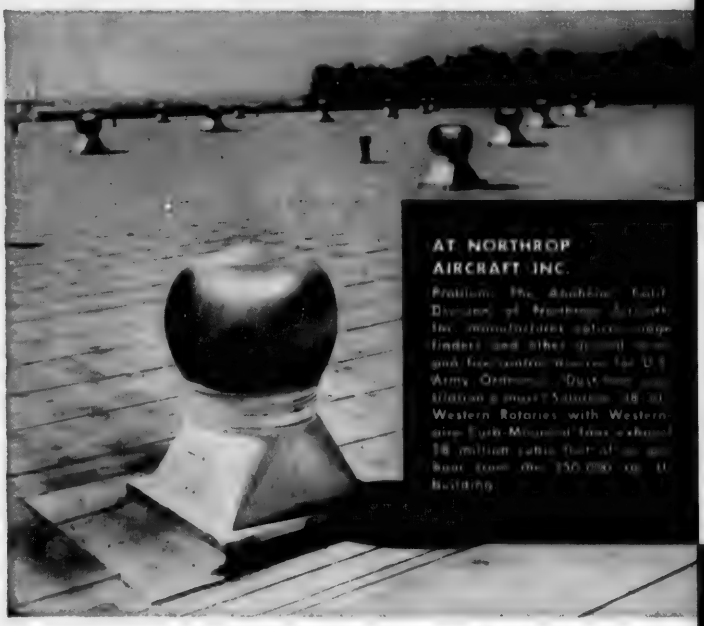
1. Use vibration isolators on fans and motors. One of the best applications of vibration isolation is to build a heavy concrete base for fan and motor and place the isolators between this base and the floor. The extra mass lowers the frequency of vibration.
2. Acoustic duct lining or sound traps may be used, particularly where the distance between fan and supply or return grille is short. On the return side of a blow-through unit, a sound trap is particularly desirable.
3. Flexible connections should be used between fans and ducts.
4. Ductwork and piping must be carefully installed with sturdy hangers—piping which is subject to vibration, such as refrigerant lines, should be on spring-loaded hangers.
5. Reciprocating refrigeration compressors, particularly those with capacity control, tend to be noisy. We have found that in extreme cases, a housing of sound absorbing material around the compressor will reduce transmitted sound and vibration to an acceptable level.

Most of the suggestions are matters of design, some of installation. Each system must be carefully analyzed to determine an allowable noise level and the methods to be used to attain it.

Roger W. Haines
Bridgers & Paxton

Albuquerque, N. M.

Where the problem is ventilation — the solution is a WESTERN SYSTEM



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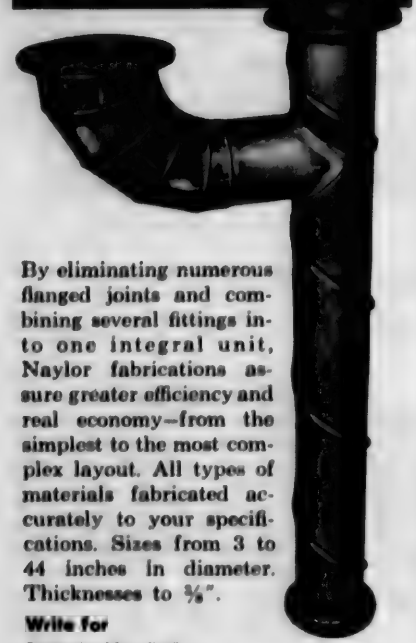

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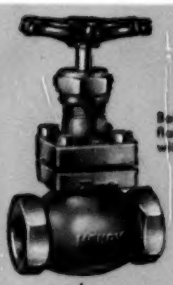
TABLES FOR DETERMINING ABSOLUTE HUMIDITY

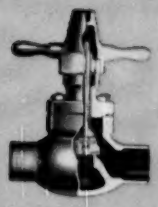
Dry Bulb Temp., °F.	Relative Humidity, Per-Cent									
	2	4	6	8	10	12	14	16	18	20
	Absolute Humidity, Grains per Cubic Foot									
30	.04	.08	.12	.16	.19	.23	.27	.31	.35	.39
35	.05	.09	.14	.19	.24	.29	.34	.38	.42	.47
40	.06	.11	.17	.23	.29	.34	.40	.46	.52	.57
45	.07	.13	.20	.28	.34	.41	.48	.55	.62	.68
50	.08	.16	.25	.33	.41	.49	.58	.66	.74	.82
55	.10	.19	.29	.39	.49	.59	.69	.79	.88	.98
60	.12	.23	.35	.46	.58	.70	.81	.93	1.04	1.16
61	.12	.24	.36	.48	.60	.72	.84	.96	1.08	1.20
62	.12	.25	.37	.50	.62	.74	.87	.99	1.12	1.24
63	.13	.26	.38	.51	.64	.77	.90	1.03	1.15	1.28
64	.13	.27	.40	.53	.66	.80	.93	1.06	1.19	1.33
65	.14	.27	.41	.55	.69	.82	.96	1.10	1.23	1.37
66	.14	.28	.42	.57	.71	.85	.99	1.13	1.27	1.42
67	.15	.29	.44	.59	.73	.88	1.02	1.17	1.32	1.46
68	.15	.30	.45	.60	.76	.91	1.06	1.21	1.36	1.51
69	.16	.31	.47	.62	.78	.94	1.09	1.25	1.41	1.56
70	.16	.32	.48	.65	.81	.97	1.13	1.29	1.45	1.61
71	.17	.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67
72	.17	.34	.52	.69	.86	1.03	1.20	1.38	1.55	1.72
73	.18	.36	.53	.71	.89	1.07	1.24	1.42	1.60	1.78
74	.18	.37	.55	.73	.92	1.10	1.28	1.47	1.65	1.83
75	.19	.38	.57	.76	.95	1.14	1.32	1.51	1.70	1.89
76	.20	.39	.59	.78	.98	1.17	1.37	1.56	1.76	1.95
77	.20	.40	.60	.81	1.01	1.21	1.41	1.61	1.81	2.01
78	.21	.42	.62	.83	1.04	1.25	1.45	1.66	1.87	2.08
79	.21	.43	.64	.86	1.07	1.29	1.50	1.72	1.93	2.14
80	.22	.44	.66	.88	1.11	1.33	1.55	1.77	1.99	2.21
81	.23	.46	.68	.91	1.14	1.37	1.60	1.82	2.05	2.28
82	.24	.47	.71	.94	1.18	1.41	1.65	1.88	2.12	2.35
83	.24	.48	.73	.97	1.21	1.45	1.70	1.94	2.18	2.42
84	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
85	.26	.52	.77	1.03	1.29	1.55	1.80	2.06	2.32	2.58
86	.27	.53	.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65
87	.27	.55	.82	1.09	1.37	1.64	1.91	2.19	2.46	2.74
88	.28	.56	.85	1.13	1.41	1.69	1.97	2.25	2.54	2.82
89	.29	.58	.87	1.16	1.45	1.74	2.03	2.32	2.61	2.90
90	.30	.60	.90	1.20	1.50	1.79	2.09	2.39	2.69	2.99
92	.32	.63	.95	1.27	1.59	1.90	2.22	2.54	2.85	3.17
94	.34	.67	1.01	1.34	1.68	2.02	2.35	2.69	3.03	3.36
96	.36	.71	1.07	1.42	1.78	2.14	2.49	2.85	3.21	3.56
98	.38	.75	1.13	1.51	1.89	2.26	2.64	3.02	3.40	3.77
100	.40	.80	1.20	1.60	2.00	2.40	2.80	3.19	3.59	3.99
102	.42	.84	1.27	1.69	2.11	2.53	2.96	3.38	3.80	4.22
104	.45	.89	1.34	1.79	2.23	2.68	3.13	3.57	4.02	4.47
106	.47	.94	1.42	1.89	2.36	2.83	3.31	3.78	4.25	4.72
108	.50	1.00	1.50	2.00	2.49	2.99	3.49	3.99	4.49	4.99
110	.53	1.05	1.58	2.11	2.63	3.16	3.69	4.21	4.74	5.27

Dry Bulb Temp., °F.	Relative Humidity, Per-Cent									
	22	24	26	28	30	32	34	36	38	40
	Absolute Humidity, Grains per Cubic Foot									
30	.43	.47	.50	.54	.58	.62	.66	.70	.74	.78
35	.52	.57	.61	.66	.71	.76	.81	.85	.90	.95
40	.63	.69	.74	.80	.86	.92	.97	1.03	1.09	1.15
45	.75	.83	.89	.96	1.03	1.10	1.17	1.23	1.30	1.38
50	.90	.99	1.07	1.15	1.23	1.31	1.40	1.48	1.56	1.64
55	1.07	1.17	1.27	1.37	1.47	1.56	1.66	1.76	1.86	1.95
60	1.28	1.39	1.51	1.62	1.74	1.86	1.97	2.09	2.20	2.32
61	1.32	1.44	1.56	1.68	1.80	1.92	2.04	2.16	2.28	2.40
62	1.36	1.49	1.61	1.74	1.86	1.98	2.11	2.23	2.36	2.48
63	1.41	1.54	1.67	1.80	1.92	2.05	2.18	2.31	2.44	2.57
64	1.46	1.59	1.72	1.86	1.99	2.12	2.25	2.39	2.52	2.65
65	1.51	1.64	1.78	1.92	2.06	2.19	2.33	2.47	2.60	2.74
66	1.56	1.70	1.84	1.98	2.12	2.27	2.41	2.55	2.69	2.83
67	1.61	1.76	1.90	2.05	2.20	2.34	2.49	2.63	2.78	2.93
68	1.66	1.81	1.97	2.12	2.27	2.42	2.57	2.72	2.87	3.02
69	1.72	1.87	2.03	2.19	2.34	2.50	2.66	2.81	2.97	3.12
70	1.77	1.94	2.10	2.26	2.42	2.58	2.74	2.90	3.07	3.23
71	1.83	2.00	2.17	2.33	2.50	2.67	2.83	3.00	3.17	3.33
72	1.89	2.06	2.24	2.41	2.58	2.75	2.92	3.10	3.27	3.44
73	1.95	2.13	2.31	2.49	2.66	2.84	3.02	3.20	3.37	3.55
74	2.02	2.20	2.38	2.57	2.75	2.93	3.12	3.30	3.48	3.67
75	2.08	2.27	2.46	2.65	2.84	3.03	3.22	3.41	3.59	3.78
76	2.15	2.34	2.54	2.73	2.93	3.12	3.32	3.51	3.71	3.90
77	2.22	2.42	2.62	2.82	3.02	3.22	3.42	3.63	3.83	4.03
78	2.29	2.49	2.70	2.91	3.12	3.33	3.53	3.74	3.95	4.16
79	2.36	2.57	2.79	3.00	3.22	3.43	3.64	3.86	4.07	4.29
80	2.43	2.65	2.87	3.10	3.32	3.54	3.76	3.98	4.20	4.42
81	2.51	2.74	2.96	3.19	3.42	3.65	3.88	4.10	4.33	4.56
82	2.59	2.82	3.06	3.29	3.53	3.76	4.00	4.23	4.47	4.70
83	2.67	2.91	3.15	3.39	3.64	3.88	4.12	4.36	4.61	4.85
84	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00
85	2.83	3.09	3.35	3.61	3.86	4.12	4.38	4.64	4.89	5.15
86	2.92	3.19	3.45	3.72	3.98	4.25	4.51	4.78	5.04	5.31
87	3.01	3.28	3.56	3.83	4.10	4.38	4.65	4.92	5.20	5.47
88	3.10	3.38	3.66	3.95	4.23	4.51	4.79	5.07	5.35	5.64
89	3.19	3.48	3.77	4.06	4.35	4.64	4.94	5.23	5.52	5.81
90	3.29	3.59	3.89	4.19	4.49	4.78	5.08	5.38	5.68	5.98
92	3.49	3.81	4.12	4.44	4.76	5.07	5.39	5.71	6.03	6.34
94	3.70	4.03	4.37	4.71	5.04	5.38	5.72	6.05	6.39	6.72
96	3.92	4.27	4.63	4.99	5.34	5.70	6.06	6.41	6.77	7.12
98	4.15	4.53	4.90	5.28	5.66	6.04	6.42	6.79	7.17	7.55
100	4.39	4.79	5.19	5.59	5.99	6.39	6.79	7.19	7.59	7.99
102	4.65	5.07	5.49	5.91	6.34	6.76	7.18	7.60	8.03	8.45
104	4.91	5.36	5.81	6.25	6.70	7.15	7.59	8.04	8.49	8.83
106	5.19	5.67	6.14	6.61	7.08	7.56	8.03	8.50	8.97	9.44
108	5.49	5.99	6.49	6.98	7.48	7.98	8.48	8.98	9.48	9.98
110	5.80	6.32	6.85	7.38	7.90	8.43	8.96	9.48	10.01	10.54

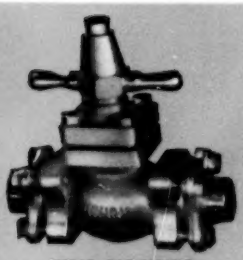
PACKLESS VALVE
With balanced-action



AMMONIA VALVE
Bolted Bonnet — screw or flanged connections. Also with screwed bonnet, sizes 1" and under



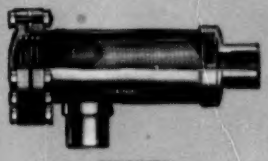
WING CAP VALVE
Non-ferrous



WING CAP VALVE
Semi-steel—with companion flanges and adapters

HENRY VALVE CO
CONTROLLING FLOW

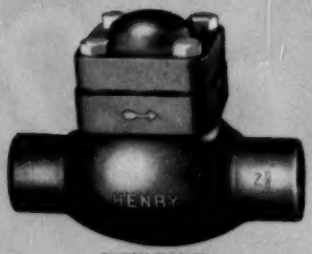
you pay—
no premium for..
the extra advantages
found in
Henry products
or for the extra satisfaction
that follows their use



STRAINER
Angle type with patented distortion-proof flange

Y-STRAINER
Brass plated. Welded steel construction with forged brass connections. Size ⅛" O. D. S. through 4⅛" O. D. S.

BALANCED-ACTION PACKLESS LIQUID LEVEL GAUGES
Valves are backseating—diaphragms may be inspected or replaced without loss of liquid. Conforms with all safety code requirements.



CHECK VALVE
Piston Type For Freon. Sizes ⅜" through 4⅛" O.D S.

DRIER
Cartridge type 12 to 500 cu. in. capacity. Sizes ⅜" to 2⅛" O.D.S

DRIER
Large diameter and capacity—minimum pressure drop.

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No. 101 Packless and packed valves, strainers, driers, check valves, relief valves, three-way valves, liquid gauge sets, flange unions and accessories for air conditioning, refrigeration and industrial uses.

No. 201 Ammonia valves and accessories.

No. 71 Drop forged and cold rolled steel fittings.

DIAPHRAGM RELIEF VALVE
Large capacity—fast positive relief and reseating action. Very small differential between opening and closing pressures.

STRAIGHT-THROUGH RELIEF VALVE
Large capacity—All Brass Construction. Sizes ⅛" M.P.T. through 1" F.P.T.

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VALVES • DRIERS • STRAINERS • CONTROL DEVICES and ACCESSORIES FOR REFRIGERATION and AIR CONDITIONING and INDUSTRIAL APPLICATIONS

HENRY VALVE COMPANY

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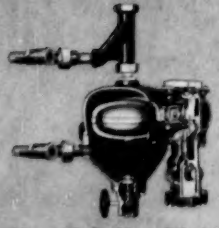
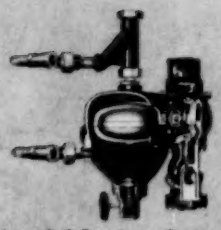
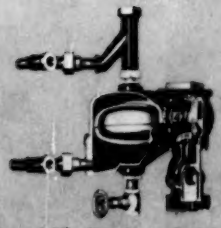


No. 47 Boiler Water Feeder — for hand-fired steam heating boilers up to 5000 sq. ft.



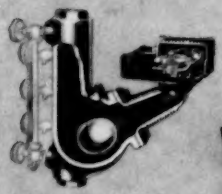
No. 47-2 Feeder - Cut - off Combination for automatically fired steam heating boilers up to 5000 sq. ft.



No. 147 Feeder Cut-off Combination — similar to No. 47, but with higher feeding level for small process boilers.

No. 247-2 — same as No. 47-2, but for installation with 1" equalizing pipes.

No. 51-2 Feeder Cut-off Combination — for automatically fired heating boilers over 5000 sq. ft.



No. 157 Water Column Type High Pressure Pump Control, Cut-off and Alarm— for boilers of any size up to 150 lbs. pressure.

No. 67 Low Water Fuel Cut-off—for low pressure steam boilers of any size.

No. 53-2 Feeder Cut-off Combination — Similar to No. 51-2, but built for higher pressure, up to 75 lbs.

High Pressure Pump Control, Cut-off and Alarm—for boilers of any size up to 150 lbs. pressure.

No. 69 "Built-in" Low Water Cut-off — Typical of many "built-ins" for installation in tappings provided in modern boilers.

No. 767 Low Water Fuel Cut-off — (with No. 14 blow-off) for easy installation into opening in boiler.

No. 61 Low Water Fuel Cut-off — for 1" equalizing pipe installation on low pressure steam boilers.

No. 101 Electric Water Feeder— operated by No. 67 or liquid level switches.

No. 63 Low Water Fuel Cut-off — for heating boilers up to 50 lbs. pressure.

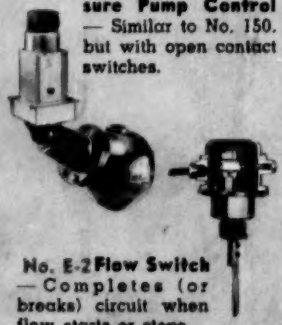
No. 21

No. 121

No. 221

No. 27

Make-up Water Feeders — to maintain adequate water supply in receiving tanks. Nos. 21, 121 and 221 are installed right in tank openings; available in various flange forms and sizes as shown to fit existing openings. No. 27 is for external application, with equalizing piping.



No. 154 High Pressure Pump Control — Similar to No. 150, but with open contact switches.

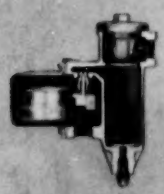
No. E-2 Flow Switch — Completes (or breaks) circuit when flow starts or stops.

No. 18 Float Valve — for maintaining water level in humidifier pans and many other liquid level control jobs. Also available in float chamber with cover, as No. 518.

No. 230M-2 — Manifold series pressure relief valve for large hot water boilers. Btu-rated. ASME standard.

No. 230 Series Pressure Relief Valves— for hot water boilers and hot water tanks. Btu-rated. ASME standard.

No. 80 Switch — Three wire high- or low-level alarm or pump control on oil storage tanks.



No. L-8 Constant Level Valve — maintains constant fuel oil pressure on burner.

No. 65 Explosion-proof Electric Controller — Underwriters' approved for hazardous locations.

No. 355 Large Capacity Float Valve— has many uses on tanks, stills, receivers, etc.

No. 455 Feed Water Controller — for multiple boiler jobs, to divert pump discharge into proper boiler.

202 Series Combination T & P Relief Valves—for hot water tanks and heaters. AGA rated.

No. 201 Temperature Relief Valve— for hot water tanks and heaters. AGA tested, rated and listed.

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